THE WELDING ENGINEER

APRIL, 1950

IN THIS ISSUE: **"Double Ending" Big Pipes . . .** page 24

A McGRAW-HILL PUBLICATION

First came the popular

BT·3

Model BT-3 holds electrodes through ¼" at 300 amps, is 11¼" long and weighs 20 ounces.

Lower prices in quantities.

$5.50

and now we're

ANNOUNCING

the new

BT·5

Model BT-5 holds electrodes through ⅜" at 500 amps, is 11¾" long and weighs 32 ounces.

Lower prices in quantities.

$7.50

Check This List of Features

JAWS: Blade-type spring steel jaws ¾" wide in BT-3 and ⅞" wide in BT-5 hold rods firmly. Unique groove arrangement permits rods to be used at four different angles, in either the right or the left hand.

JAW INSULATORS: Made in the Jackson-originated channel and crown type design (patented), they give more protection and deflect the arc heat. Made of a new material which increases many times the impact, flexural and compression strength of Jackson insulators. Upper and lower insulators are interchangeable, for even longer work life.

LEVER provides smooth and immediate rod changes, has complete, one-piece insulation.

CABLE CONNECTOR of copper alloy makes flat, metal-to-metal contact full width of both blades. Cables may be brazed, soldered, or clamped in place.

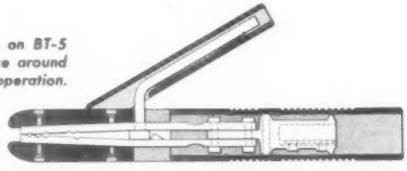
HANDLE of finest quality hard-boned fibre, has heavy wall thickness—minimum metal contact—is exceptionally cool in operation.

Jackson Blade-Type Electrode Holders are NOW available in TWO Models

Several months ago we offered you a superior 300 amp. blade-type holder. It is well liked and doing an excellent job. Now we have added a larger capacity, 500 amp., blade-type holder for your heavier demnds. So whatever capacity holder you desire, there is now a Jackson quality blade-type holder to do your job *economically*, and *safely*.

- They consist of a minimum of parts, all easy to replace, and at low cost.
- Metal parts are more completely insulated. Crown-type jaw insulators, that hug the blades, are made of laminated fiberglass with melamine binder, and are stronger than ever.
- Test them hard, like we did. You'll find these holders easy to operate and *cool working*.

Large diameter handle on BT-5 provides large air space around metal parts for cool operation.



Sold world-wide only through distributors and dealers

JACKSON

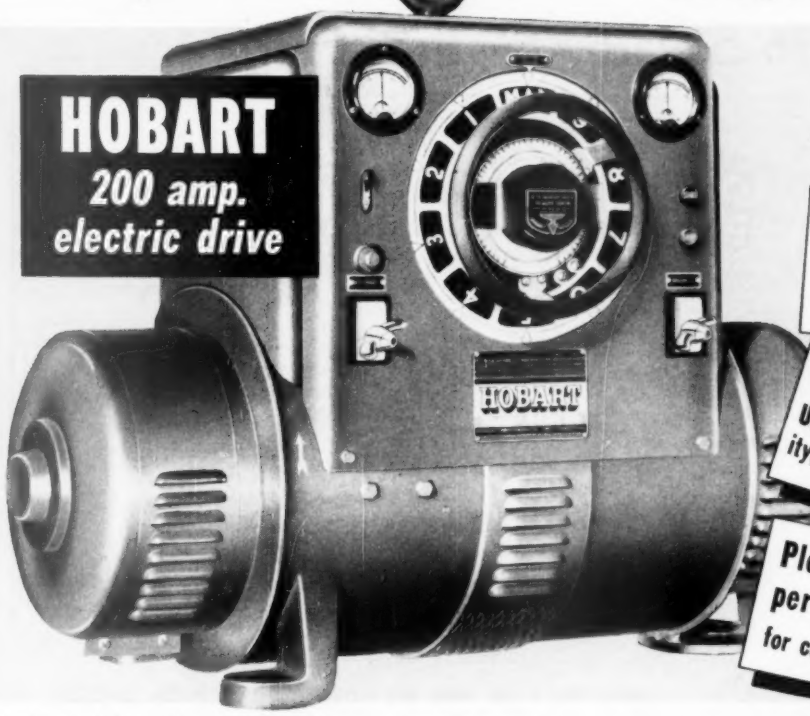
PRODUCTS

WARREN · MICHIGAN

WORLD'S LARGEST MANUFACTURER OF ELECTRODE HOLDERS

Compare...COMPARE

...Quality of Welding
...Ease of Welding
...Length of Life



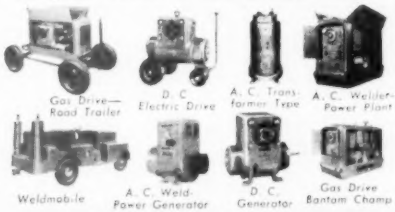
REMOTE CONTROL at no extra cost

Longer Life ...conservative rating. Less overload

Easier Welding Unusual arc stability, separate exciter

Plenty of Copper and Steel for cooler running

You'll find just the right welder for your needs in the HOBART line



HOBART

Switch to HOBART ELECTRODES and see the difference in weld speed and quality

On light work or heavy, overhead or down-hand—there's a HOBART electrode made to give you better results whether you are using A. C. or D. C. welders. Easier to use. Less spatter. Check coupon for catalog listing full range of sizes and types.

HOBART performance gets the PROFITS

If you think "beauty is only skin deep," you should see the *inner workings* of the Hobart Multi-Range Arc Welder laid out alongside others. You'll find that Hobart's "good looks" are only the natural result of extreme care in designing functionally from the inside out.

Compare Hobart all the way through—note the husky, rugged construction of motor and generator—the ingenious use of copper and steel to add CONVENIENCE of operation to increase the operator's productivity. You'll know WHY you can expect higher quality welds made faster and more easily, and why you don't have to worry about lost time or maintenance expense.

Get your share of the EXTRA PROFITS that come from EXTRA PERFORMANCE—in other words, CHOOSE HOBART when you need another arc welder.

"One of the world's largest builders of arc welders"

HOBART BROTHERS CO., Box U-40, Troy, Ohio

We want more proof that HOBART is today's biggest value in arc welders of —— amp. capacity. Also send information on items checked.

FREE!

Use coupon and receive valuable "Guide to Better Welding"

☐ D. C. Generator ☐ Road Trailer ☐ D. C. Electric Drive ☐ Weldmobile
☐ D. C. Gas Engine Drive ☐ A. C. Transformer Type ☐ A.C. Welder—A.C. Power ☐ A.C.—A.C. Generator only
☐ Accessories ☐ Electrode Catalog

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FIRM NAME _____

ADDRESS _____

An Important **EXPANSION**

In Silvaloy Distribution!

SILVALOY

SILVER BRAZING ALLOYS

A successful product attracts the most efficient distributors . . . always. That's basically why SILVALOY Silver Brazing Alloys are now distributed by Fort Duquesne Steel Company and The Hamilton Steel Company, serving the important industrial areas indicated on the map above.

Their facilities and co-operation mean stocks and data when and where you need them . . . but their service goes beyond sales. Long years of experience enable them to supply sound technical advice and to work hand-in-hand with you in determining the most suitable and economical alloy for your purpose. They are good people to know and depend on.

The more popular SILVALOY Silver Brazing Alloys are listed in the table at the right. SILVALOY 15 is a silver-copper-phosphorous alloy for brazing copper and copper alloys. The five other SILVALOY alloys are quaternary silver-copper-zinc-cadmium alloys, covering the wide range of general brazing operations. For special applications we have a complete selection of other silver solders.

	SILVER CONTENT	MELTING POINT	FLOW POINT
SILVALOY 15	15%	1185°F	1280°F
SILVALOY 20	20%	1430°F	1500°F
SILVALOY 35	35%	1125°F	1295°F
SILVALOY 40	40%	1135°F	1205°F
SILVALOY 45	45%	1125°F	1145°F
SILVALOY 50	50%	1160°F	1175°F

APW No. 1100 Low Temperature Flux and APW No. 1200 Universal Flux recommended for use with these alloys.

THE AMERICAN PLATINUM WORKS

231 NEW JERSEY R. R. AVENUE NEWARK 5, N. J.

THE WELDING ENGINEER

THE WELDING ENGINEER, *with which is combined The Acetylene Journal*

A McGRAW-HILL PUBLICATION

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THE WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

IN THIS ISSUE

COVER: *Bechtel Corp., Santa Clara, Calif., has brought production methods, including automatic welding, to pipe lines. More details on page 24.*

Research

Six Advantages of Scratch Hardness Testing 17
JOHN H. HRUSKA

Salvage

Underwater Welding Aids Ship Salvage 20
ROBERT H. BURKS

Production

Gas Welding Aluminum Awnings 23
Modern Shop Practice for Modern Ranges 28
GERALD ELDRIDGE STEDMAN
Building Diesels by Unit Assembly 32
E. F. McCALEB
Production Brazing 36
CLINTON E. SWIFT
Precision Instruments Precision Welded 39
LEE H. JUDGE

Construction

Double Ending" Saves Welding Time, Cuts Handling 24
Quick Way to Make Box Beams 35

Maintenance

Metallizing Renews Offset Press Cylinders 26
ELTON STERRETT

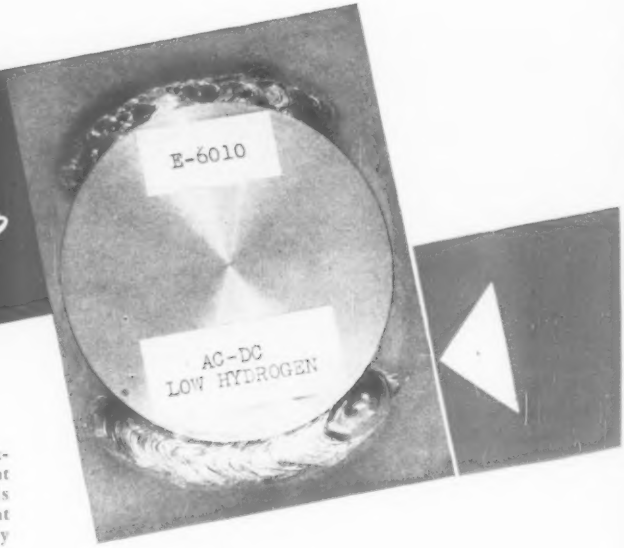
Foreign

Big Welding Jobs in Australia 40

DEPARTMENTS

Editorial 15
New Products for Welding 42
Engineering Data Sheet No. 115 49
Free Literature 51
On the Job 54
News of Welding and Welding Men 58
About People 76
From the Patent Office 80
Searchlight Section 83
Where to Buy 83
Advertisers in This Issue 84

Welding Hardenable or Sulphur-bearing Steels?



1. Fewer structural failures from underbead cracking—Ordinary electrodes deposit a large amount of hydrogen in weldments on hardenable steel. This produces underbead fissures *not* generally apparent in routine inspection, which in turn causes early structural failures in service. General Electric *low-hydrogen* rods have a special coating which materially reduces the amount of hydrogen deposited, thereby largely eliminating the basic cause for such failures.

2. Better mechanical properties—Laboratory comparisons between these low-hydrogen electrodes and class E6010 electrodes show the former to possess higher tensile and yield strength, better elongation, and *higher impact* at both room and sub-zero temperatures.

3. Welds can be successfully enameled without heat treatment—as has been actively demonstrated on both a laboratory and production basis.

4. Materially improved operating characteristics—G-E low-hydrogen electrodes are extremely flexible in application, with either a-c or reverse polarity d-c; spatter is minimized, deposition efficiency is high, penetration is adequate but not excessive. There is little or no tendency for surface holes to occur in metals of relatively high sulphur content—and in all cases the finished weld offers an excellent appearance. (Note lower bead in photo above.)

THESE ARE THE G-E "LOW-HY FAMILY"

W-32 is the "father" of the line, having been offered since 1945. A new, greatly improved version was recently introduced—and this performance-proved electrode is now listed at a new, attractive price.

W-60, W-61, W-62 are three new additions, with recommended applications as follows:

W-60—For welding hardenable steels where hazards of underbead cracking are to be eliminated.

W-61—For a wide variety of low-alloy, "high-tensile" steels.

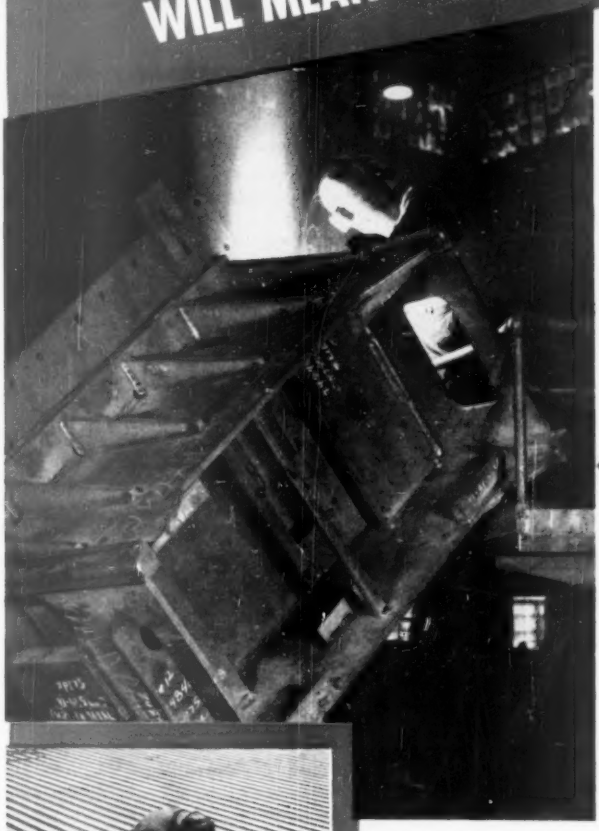
W-62—For use on steel castings and for producing weld deposits having high impact properties at subzero temperatures.

AND THESE OTHER G-E ELECTRODES CAN DO AS MUCH FOR OTHER WELDING JOBS

Mild-Steel and General-Purpose Electrodes—This group of 9 types is headed by W-28, a new general-purpose, all-position rod with an unusually stable arc that produces welds of superior appearance, at high speeds, with minimum convexity. Other electrodes in this group are available specifically for horizontal, vertical, or over-head welding, etc. **Stainless Steel Electrodes**—27 types (16 for d-c, and 11 for a-c or d-c) make this one of the most complete stainless lines available. Each type is keyed to specific AISI code numbers for easy selection. Special, double-carton packaging protects the rod against moisture as well as providing extra protection against transit and storage damage.

Cast-Iron, Hard-Surfacing, & Phosphor-Bronze Electrodes—Herein are some of the more recent additions to the G-E electrode line; W-2075 for making machinable welds on cast-iron; W-94 for abrasion-resistant, hard-surfacing applications; and W-70 for phosphor-bronze welding. They are exemplary of G. E.'s welding laboratories' constant search for better electrodes, improved equipment, and more efficient welding processes.

HERE'S WHY G-E LOW-HYDROGEN ELECTRODES WILL MEAN MONEY IN YOUR POCKET



HERE'S WHAT USERS FIND WITH G-E "LOW-HY" ELECTRODES

Production had virtually stopped at a Pennsylvania machinery manufacturer's plant because cracks were developing in weld-fabricated steel parts. A rush shipment of W-32 from our Philadelphia distributor eliminated the cracking and had them back in production the same afternoon.

Arc welding in general and W-32 electrode in particular played an important part in fabricating this ram or slide for a 200-ton, straight-side crank press. Welded construction with W-32 was used extensively throughout the entire press.

A mid-western transformer manufacturer now swears by W-32 after finding that it completely eliminated a severe cracking and porosity problem in the fabrication of transformer tanks.

You can order these low-hydrogen electrodes from your G-E Arc-welding Distributor today. And ask him for your copy of the new pocket-sized electrode catalog, GEC-482. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

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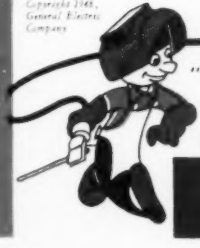
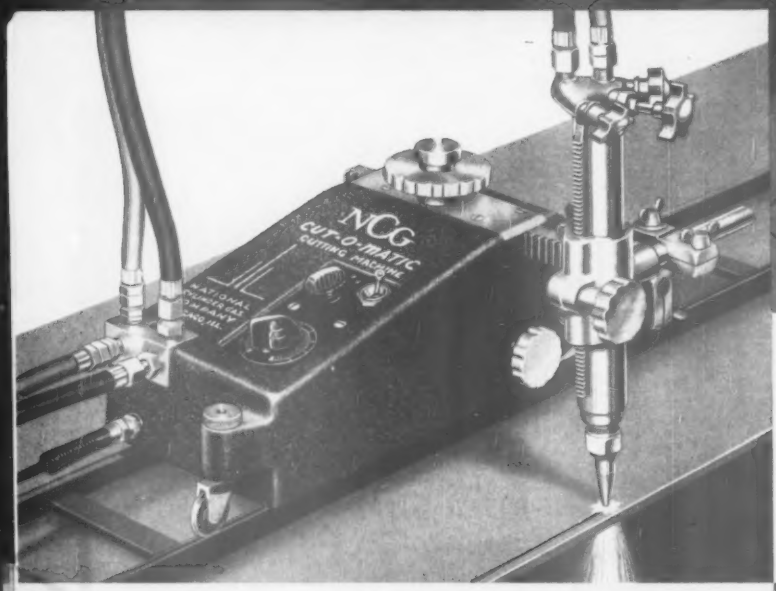
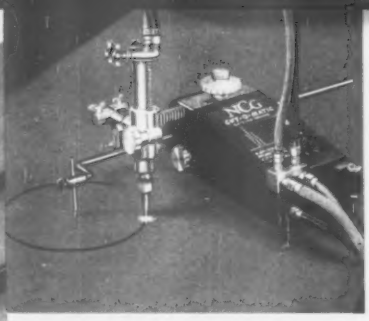


"A-C or D-C . . .
there's G-E Arc-welding Equipment for Every Application!"

ARC WELDERS • ELECTRODES • ACCESSORIES

GENERAL ELECTRIC





CIRCLES AND ARCS

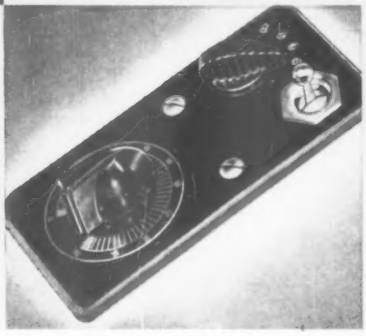
Circles or arcs, up to 60-in. in diameter, are cut by attaching radius rod assembly. Larger diameters may be cut with extension rod. Rings may be cut with double torch mounting.

SIMPLE CONTROLS

The Cut-O-Matic Control Panel is simple. A selector switch sets the travel at one of four speeds, and a rheostat permits accurate regulation anywhere between 4-in. and 60-in. per minute, in either direction.

CUT-O-MATIC

NCG'S PORTABLE, MOTOR-DRIVEN FLAME-CUTTING MACHINE



LOW-COST, VERSATILE, ACCURATE, FAST

Flame-Cutting with Substantial Savings in Labor and Materials

Here's a small, inexpensive cutting machine that's so efficient that grinding or machining of cuts are rarely necessary . . . That's so versatile you can cut light plate or heavy slabs—straight lines, bevels or various shapes . . . That's so portable you can take the machine to the job—inside or outside the shop, wherever power is available. And it has exclusive operating features that make it remarkably easy to handle.

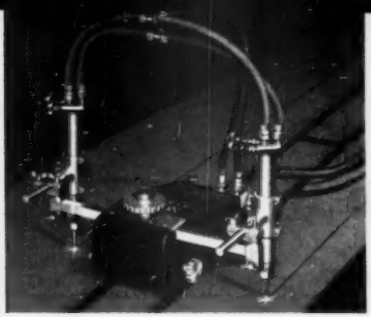
Yes, the NCG Cut-O-Matic is so efficient and so flexible in use that one man and a Cut-O-Matic make a hard-to-beat team to save time, labor, and materials.

The Cut-O-Matic is not only a money saver in the larger plant but in small shops, too. In countless instances the low price of the Cut-O-Matic has enabled small businesses to enjoy the recognized superiority of machine cutting—with its sharper, cleaner cuts and its overall economies in time, materials and gas.

Cut-O-Matic offers so many advantages that you'll want a copy of the illustrated booklet describing the unit in detail. If you'd like a demonstration right in your own shop, just check the box in the coupon at the right.

STACK CUTTING

Stack cutting gives real production economy and speed. Sheets clamped together may be cut uniformly. Circles and arcs as well as straight lines are easily stack-cut.



STRIP CUTTING

Strips up to 29-in. wide can be cut by adding torch holder, torch and hose assembly. Wider strips may be cut by using extra length equipment. Narrow strips may be cut by mounting two torches side by side.

IRREGULAR SHAPES

Limited irregular shapes may be cut by guiding the Cut-O-Matic by hand. Rear wheel is castered to facilitate travel. Cuts are much better than those made with a hand cutting torch.

FREE-WHEELING

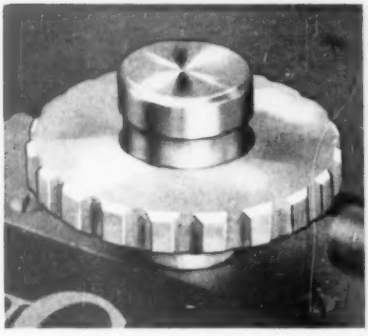
Fingertip clutch control is combined with a cross-feed gear rack adjustment to permit moving the machine on track while adjusting the cross-feed, in one simultaneous operation.

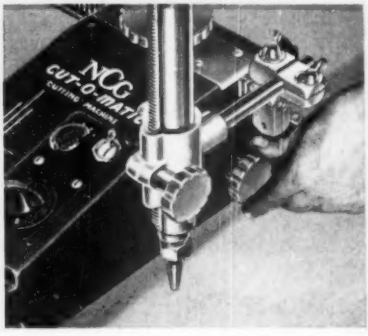
EASY CHANGE-OVER

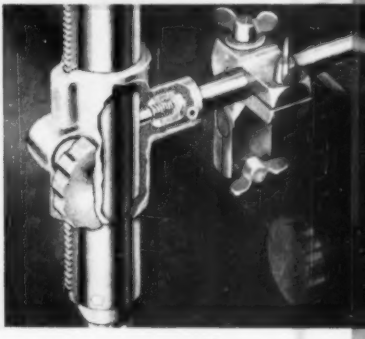
It's easy to switch from cutting straight-line to circles. The friction knob is loosened, as illustrated, and the inside drive wheel is disengaged. The outside wheel then propels the machine around the center point.

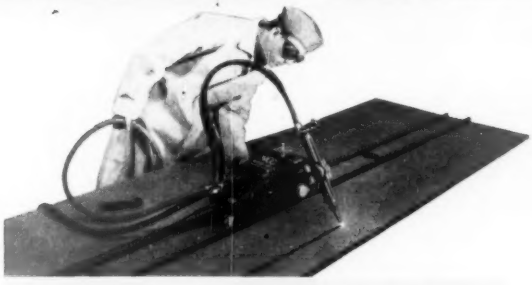
SMOOTH—RIGID

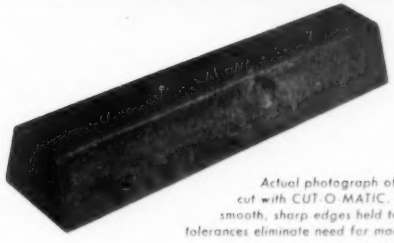
No ragged cuts caused by excessive play and uneven racking. A special clamp adjustment, plus a spring-loaded pressure plug, holds torch in rigidly, yet permits smooth racking.











Actual photograph of bevel cut with CUT-O-MATIC. Clean, smooth, sharp edges held to close tolerances eliminate need for machining or grinding.

NCG CUT-O-MATIC STANDARD UNIT

F.O.B. FACTORY, LOUISVILLE, KY

$185

Complete with torch, tip, radius rod, track, hose, cable and torch wrench.

CUT-O-MATIC possesses all the quality characteristics of famous NCG heavy-duty flame-cutting equipment. Sturdy, simply designed for efficient operation and easy maintenance, the CUT-O-MATIC is a dependable tool that will give you long trouble-free service.

NATIONAL CYLINDER GAS COMPANY

NCG

EVERYTHING FOR WELDING

Executive Offices:

840 N. Michigan Avenue, Chicago 11, Illinois

Copr. 1950, National Cylinder Gas Co.

NATIONAL CYLINDER GAS COMPANY
840 N. Michigan Ave., Chicago 11, Ill.

Please send me Illustrated Booklet N-134 describing in detail the versatile CUT-O-MATIC Flame-Cutting Machine.

NAME _____ POSITION _____

COMPANY _____

STREET ADDRESS _____

CITY _____ ZONE _____ STATE _____

☐ I would like a demonstration in my own shop.

AO Safety Clothing

AO Safety Clothing keeps out of the Worker's Way!

Whether it's a coat, overall, mitten, glove or spat . . . when you order safety clothing from AO you obtain maximum comfort and serviceability as well as protection. The AO welders' clothing illustrated of chrome-tanned cowhide is typical. Your nearest AO Safety Products Representative can supply you.

208BCL CAPE SLEEVE WITH DETACHABLE BIB

Does a 3-way protection job on arms, chest and shoulders. Typical AO thoroughness is shown by the double cotton stitching and steel sewing of all seams. Seam ends reinforced with rivets. Bib attached to front of cape with steel fasteners. Anchor button at each armpit keeps cape securely buttoned. Standard sizes are double extra large, large, medium and small.

207CL OVERALL

Has protected the legs and chests of thousands of welders on the toughest jobs. Large one-piece bib. All seams double cotton stitched and steel sewed. Leather shoulder straps with buckles for fast adjustment. Trouser legs 24" wide at bottom, 11" wire pocket on left leg. Hip pocket with flap. Ten waist sizes — allow 4" over regular pants size when ordering.

142CL APRON

One of a variety of regular and split leg aprons that safeguard the body against sparks, splashes, cuts and abrasions. Regular model shown is size 24 x 42.

4903CL SPAT

An AO spat that has proved itself invaluable on the job time after time. Protects instep and ankle. Easily adjusted at top and under instep by snap fasteners. Releases immediately in one speedy motion. Chrome leather flare over instep.

Your AO Safety Products Representative can supply you

American Optical Company
SAFETY PRODUCTS DIVISION
Southbridge, Massachusetts • Branches in Principal Cities

For Top Flight Gas Welding

Choose from AIRCO'S complete line of Oxyacetylene Welding Supplies

Time Proved . . . Job Tested . . . Money Saving

Available from Local Stocks

That's right! Whether you use a popular Airco gas welding rod, flux, or brazing alloy for production or maintenance operations . . . you're certain of top-notch work—ask any one of the thousands of welders who swear by these Airco oxyacetylene welding supplies.

This well-recognized reputation for top performance didn't just happen—more than thirty years' experience and development have gone into the manufacture of these outstanding gas welding supplies . . . know-how that produces high quality, reasonably-priced items that guarantee a job done faster, done better, done easier and done at less net cost.

For further information about Airco's oxyacetylene welding supplies which includes a complete line of rods, fluxes and brazing alloys, write your nearest Airco Office or Authorized Dealer for a free copy of Catalog 12.

More news about AIRCO products

AIRCO No. 1 ALLOY STEEL

A Smooth-Flowing, High Ductile Rod Insuring Good Control of Molten Pool

This rod (AWS Classification GA60) is ideal for welding low carbon and low alloy steels, including pipe of grades A and B analysis. Outstanding among its many important features is the high ductility in the "as welded" condition. Because of its mechanical properties, this rod is desirable when undertaking qualification tests like those included in The American Standards Association Code for Pressure Piping. It is smooth flowing, insuring good control of the molten pool, and, in addition, will withstand considerable heating without burning.

PHOS COPPER

A High Standard Copper And Phosphorous Brazing Alloy

It is self-fluxing when used on copper-to-copper joints but requires a good low melting point flux when brazing brass, bronze or other alloys. It is completely fluid at approximately 1382° F. at which temperature best results are secured and is used in the manufacture of electrical, refrigeration and air conditioning equipment. Available in rod and strip form.

AIRCO MARVEL BRAZING FLUX

A High Quality Flux That Remains Molten And Viscous Over A Wide Temperature Range

It is a uniformly high-quality flux for use in braze welding cast iron, malleable iron, copper and steel and for welding brass, bronze and copper. Marvel Flux remains molten and viscous over a wide temperature range. Its use protects the weld metal from oxidation and effectively reduces or removes oxides and other foreign matter. Marvel Flux is a general purpose flux for the welding shop.

AIRCO **AIR REDUCTION**

Offices in Principal Cities

• With a thumb movement of barely over one quarter of an inch you light the full, adjusted flame on the Harris Automatic Torch. With a reverse motion you shut it off, leaving a small acetylene pilot light for subsequent relighting of the full flame.

When the Harris Automatic Torch is used, one hand is always free for holding filler rod, positioning work, changing pieces. The effect on output . . . both as to quantity and quality . . . is immediate and stimulating.

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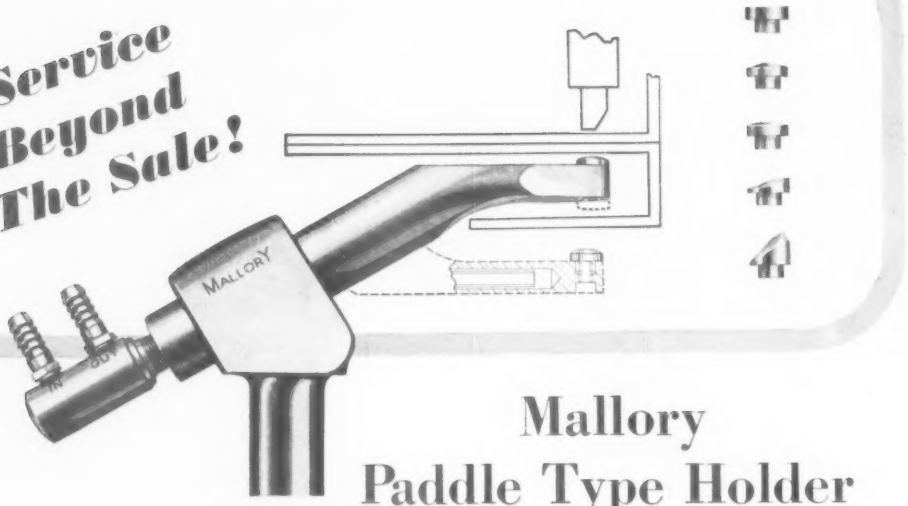

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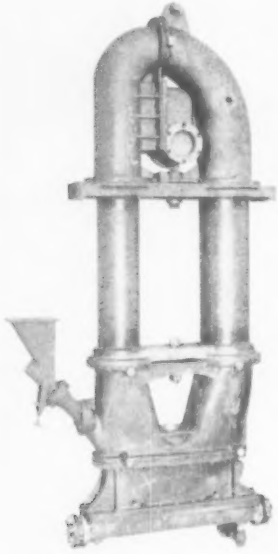

Fig. 1. Wheeler Fluid Energy Reduction Mill, jet type, approximately 400 mph. system velocity. Feeding of ¼" diameter aggregate causes abrasion on inner chamber walls.

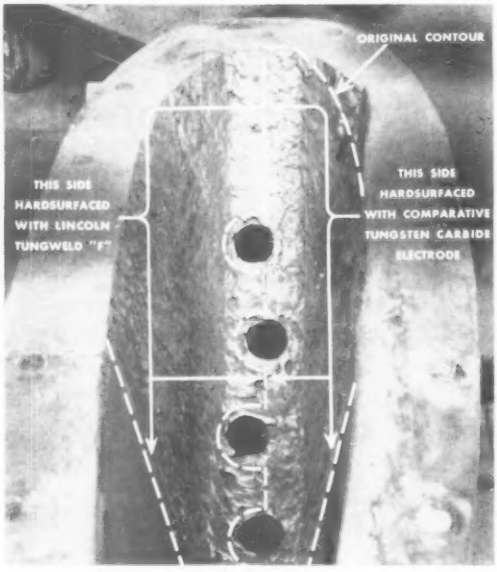
ORIGINAL CONTOUR
THIS SIDE HARDSURFACED WITH LINCOLN TUNGWELD "F"
THIS SIDE HARDSURFACED WITH COMPARATIVE TUNGSTEN CARBIDE ELECTRODE

Fig. 2. Lower half of grinding chamber for C. H. Wheeler Fluid Energy Reduction Mill. Shows condition of hardsurfacing after processing 75 tons of aggregate.

By O. A. Wurtenberg, Design Engineer
The C. H. Wheeler Manufacturing Co.
Philadelphia, Pa.

TO provide our customers with the longest possible equipment life, continuous research is being done on different hardsurfacing materials. Of the types of hardsurfacing electrodes tested, the tungsten carbide type appear to produce the best wear resisting results. In recent comparisons particularly, the Lincoln "Tungweld F" has shown greater resistance to abrasion than all other types of hardsurfacing electrodes compared in our research test runs.

In a recent test, the reduction chamber of a cast alloy steel fluid energy reduction mill was hardsurfaced with two similar (tungsten carbide) types of electrodes. (Fig. 2). One-half was hardsurfaced with Lincoln "Tungweld F" and the other half of the chamber faced with a comparative tungsten carbide electrode. After pulverizing tons of ore, the unit was disassembled and inspected for wear. The results are shown in the photographs above. The area surfaced by the comparative tungsten carbide electrode required 12 pounds of additional electrode to build it up to the original shape. The area surfaced by "Tungweld F" showed some wear but there was sufficient metal left to withstand an estimated 33⅓% additional tonnage of ore processing before any resurfacing would be necessary.

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LINCOLN

THE WELDING ENGINEER

ESTABLISHED 1916 APRIL, 1950

Time for Spring Cleaning

SOMETHING SEEMS to have gone out of us lately. We Americans, who used to be the peppiest and most ambitious people on earth, are becoming lazy. We don't seem to be able to work as hard as we did . . . like to take it easy . . . look for pensions and so-called security plans instead of a chance to forge ahead.

What's robbing us of the thews and sinews of our national strength? My guess is that it's the cumulative effect of larger and larger doses of the poison being brewed by paternalistic and socialistic bureaucrats.

We are becoming confused where once everything was as plain as black and white. Once we had the acid test of common sense; now common sense just isn't in evidence in either the national or international picture. We find it hard to believe that there is such a thing any more. But when we lose faith in common sense, we lose the ability to do our own thinking. We let our brains be lulled to sleep with the siren song, "We can't understand it, but it must be right because they say so."

I'm afraid that some of the sleepers are in for a rude awakening.

If you would like a little mental exercise, why did the President of the United States fail to realize that a national emergency in coal was at hand until after every literate man, woman and child had had the facts dinned into them for weeks? Would he deliberately allow a paralyzing coal strike to drag on and on, stopping trains, closing schools, curtailing electric power, shutting down hundreds of factories, throwing thousands out of work and causing millions of home-owners and renters to shiver in unheated rooms? Why did the President wait until the zero hour? He knows—we don't.

Again, who in high authority seems to care how many traitors, perjurers, Communists and other riffraff are in the employ of the State Department? And why do we shut up our atomic secrets tightly in our national right hand and hold them out openly on our left for visiting scientists to pilfer?

My own belief is that there's hope for the future because the majority of people in this country is still sane. About 99% of us don't want any part of what is happening in Russia, and a sizable majority isn't anxious that things over here should be run as they are in postwar Britain.

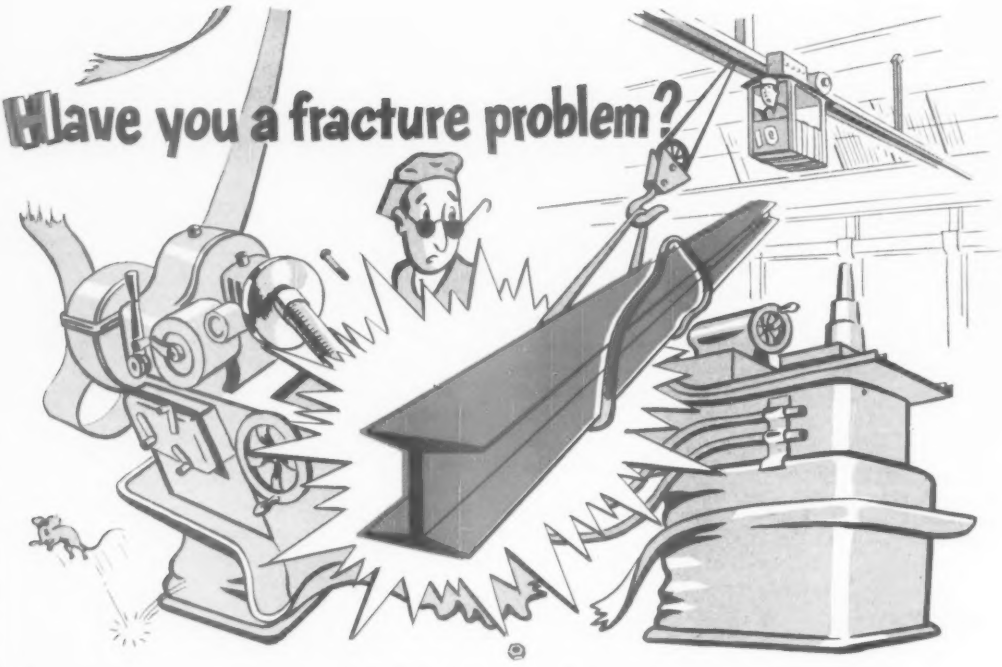
In Russia, the average child rarely receives any education beyond the fifth grade; in England he leaves school at an average age of 14. They say that our own system of government and private capital is obsolete, "reactionary" and outmoded, but the facts are that your children and mine will grow up to be the best educated youngsters in the world, on an average. Amazing, isn't it?

Maybe that old family car still has some pull left in her. Maybe we ought to think twice—and twice again—before we trade her in on a new model with Russian or British gear shift. She was a pretty good car in her day, and she took us to a lot of good places.

Our country, vast as it appears when we have to cross it, represents only 6% of this planet's total land area. Our 150,000,000 citizens are only 6% of the earth's total population. What we lack in numbers and land, however, we have more than made up in national energy. We have provided the most goods and services to the largest number of people at the lowest cost. We have enjoyed the world's highest standard of living. We have put such luxuries as the automobile within the reach of every man able and willing to work. Our modern manufacturing methods (in which welding has played no small part) have given us leisure and riches such as no other people in all the world's history have ever had.

Shall we swap all this for confiscatory taxes, rationing and reams of regulations and red tape to wrap up the simplest everyday actions? Or shall we try to clean up the thinking of the chuckleheads who don't see that this United States—as it is today—is the best country in the world to live in? Shall we try to clean up their thinking—and clean out the politicians who bewilder and befuddle them for selfish reasons of power?

Spring cleaning time is here!



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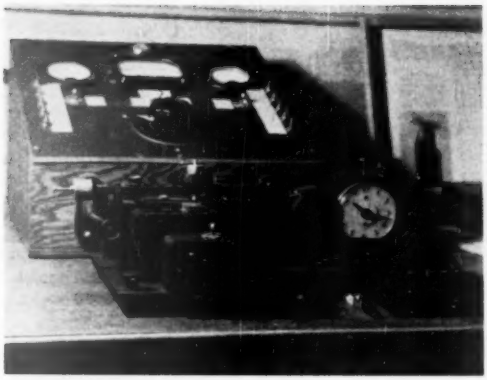
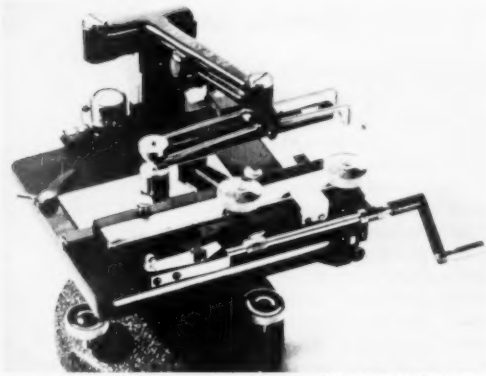


1—SCLEROMETER is driven by small electric motor and utilizes a diamond pyramid as a scratching tool



Courtesy American Optical Co.

2—MICROCHARACTER, developed by Bierbaum in 1923, is also used for testing scratch hardnesses of welds

Six Advantages of Scratch Hardness Testing

BY JOHN H. HRUSKA
Consulting Engineer, Hinsdale, Ill.

HARDNESS TESTS represent, without doubt, the best approach towards an ultimate and technically correct solution of the problem of finding a reliable criterion for the much discussed term "weldability." But even so, ordinary hardness testing remains a hit-or-miss surveying of arbitrarily selected points or areas on ground cross-sectional specimens

1 Testing scratch hardness is of significance in the evaluation of weld characteristics by detecting local hardening or softening phenomena.

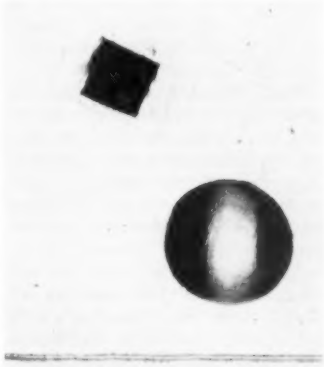
2 Micro-cuts produced under standardized conditions save considerable exploration time and are apt to locate existing zones of different hardness with better probability than by more conventional surveys of indentation hardness.

3 Relative uniformity of welded joints may easily be checked by tracing a few micro-cuts made over suitably prepared cross-sectional specimens.

4 If desired, photographic records of controlled micro-cuts may serve as directives for more elaborate surveys by the Knoop and Vickers indenters.

5 Resistance to scratch while specimens are at an elevated temperature may be studied by the simple addition of a small electric furnace to the platen of the sclerometer.

6 Conversely, an insulated chamber containing a cooling fluid circulated by means of a small pump enables welds and materials to be tested at temperatures down to —100 F.



3—SCRATCH HARDNESS trace (bottom) compared at 100X with a Vickers indentation (top) and a Rockwell B indentation (center)

Tests made by Microcharacter

(Photos, courtesy American Optical Co.)

of the welded joint. A continuous test for ascertaining changes in the hardness of welds is made possible by scratch hardness testing.

Until recently, however, the practical utilization of scratch hardness tests in welding control and research was very limited. Both the apparatus and manual dexterity needed to conduct reproducible measurements on weld specimens have been confined to a few research workers. Practically no report on the results of similar studies has been recorded—as the author knows after a painstaking review of available technological literature.

Early in 1941, however, the author was confronted with the problem of premature spalling of cobalt-chromium-tungsten facing deposited on silcrome valves used in large Diesel engines. In the course of this work, it became obvious that any testing by indentation hardness would follow the time-honored shotgun pattern and would probably miss areas near the weld which could be of vital importance. A more systematic method of surveying those areas was highly desirable.

The few known and commercially available scratch hardness testers were given first consideration. All of them suffered from the same objection: widths of the scratch were noticeably dependent upon the velocity at which the scratch was produced.

A New Sclerometer

Lately, there has been made an electrically regulated sclerometer, which was designed to eliminate some of the previously known shortcomings. The following changes in principles were considered deviations from previous scratch hardness tests:

(1) The scratch point or tool should be of durable material and should have some relationship in geometrical outline to established indentation tests. An indentation test then becomes a scratch test with zero velocity.

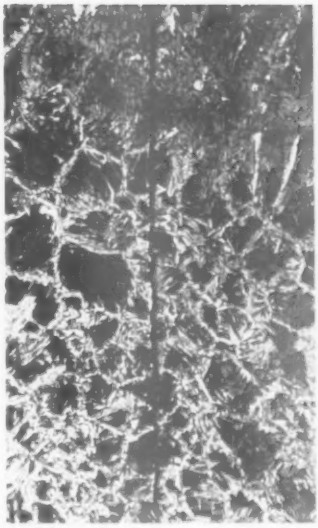
(2) The load application should be more accurate and should eliminate the frequently advocated use of helical springs. This follows the now prevalent trend towards deadweight loading in many testing devices.

(3) The speed at which the scratch is produced should be both controllable and measurable. This factor has hardly ever been incorporated into the design of a sclerometer.

(4) Since welds (and materials in general) are often expected to render efficient service at either very low or at elevated temperatures, the apparatus should permit additions of small cooling or heating chambers to hold the tested specimens. Such a chamber must, of course, permit convenient measurement of the temperatures of the specimens at all times, whether at high or low temperature.

The above four considerations prompted the design of a sturdy little instrument which utilizes a standard 136-deg diamond pyramid as a scratching tool. Its loading is accomplished by weights of a high-grade analytical balance. The speed of the scratch is regulated by varying the voltage of a small electric motor, the gear of which moves the platen with the specimen very much in the same manner as the course movement of a microscope. The direction of the scratch may be changed by simply reversing the switch of the motor. The setting of voltage on a variable control determines the speed at which the platen and its rigidly clamped specimen will travel under the diamond pyramid. The setting of the voltage control, actual voltages and resultant speeds were calibrated by actual stop-watch readings, and the lengths of travel were marked on the scales of the apparatus in millimeters or inches. These experiments indicate that the average speeds are identical for either direction and under any loads up to 275 grams. A 10-mm distance is traveled in 28.5 seconds at 140 volts; in 128.0 seconds at 60 volts and in 37.0 seconds at 110 volts.

The equipment used in this investigation is shown in Fig. 1 (without the special box containing the insulated chamber for determinations of cold and hot hardness). The weld specimens are usually prepared to a surface smoothness as for metallographic work. Smaller samples are mounted in Lucite and are subsequently inserted into a specimen holder, in turn clamped to the movable platen of the sclerometer. Considerable experimentation was done with varying loads and speeds for certain hardness ranges of metallic materials, and the data secured are of absorbing theoretical interest. For practical laboratory technique, however, it appears that a load of 100



4—100X

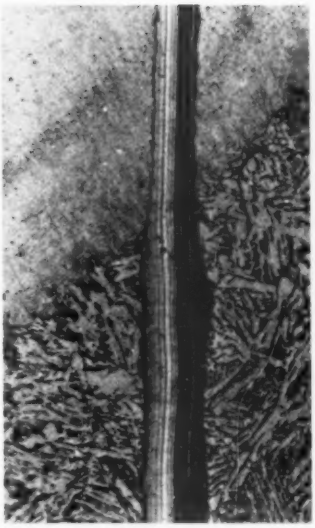
MICRO-CUT through weld metal, hardened and grain-refined zones

5—500X

SCRATCH through weld metal and through adjacent hardened zone

6—100X

SCLEROMETER scratch through cobalt-chrome-tungsten alloy deposit



7—500X

WIDTH OF scratch varies as the hardness increases or decreases

grams upon the indenter at a velocity of 1 cm per minute gives readily ascertained widths of scratch at magnifications of 100, 500 or 1,000 diameters for nearly all types and grades of specimens made in the average welding shop. Studies are being continued in the author's laboratory in an endeavor to correlate these empirically determined selections of load and speed to more fundamental units of work or energy.

Indentation vs. Scratch

A simple visual comparison between Vickers and Rockwell B indentations and a scratch hardness trace or furrow may be convincing evidence for the usefulness of controlled scratch tests. All of the traces shown in Fig. 3 were made on a homogeneous sample of steel under standardized conditions. The excessive size of impressions made by Rockwell, Vickers and Brinell hardness testers had been sufficiently demonstrated long before the basic influences of microstructures upon the ultimate properties of welds were duly understood. This shortcoming was repeatedly felt and voiced in many published and restricted reports of governmental and industrial welding organizations throughout World War II. Either time limitations or the danger of confusion ensuing from the unavoidable addition of "one more" hardness scale apparently prevented further development, or at least a more general acceptance, of such continuous hardness tests. Even the limited use of that method, however, has given us worthwhile information on projects relating to such important weldments as armored vehicles, Diesel engines, aircraft and ships.

Testing on "Microcharacter"

A few examples of scratch hardness testing may help to illustrate the results obtained. In Fig. 2 is pictured the "Microcharacter"—developed in 1923 by C. H. Bierbaum—in its latest improved form. This apparatus has frequently been used for testing the scratch hardness of welds. Fig. 4, magnification 100X, shows a scratch or cut through the weld metal, hardened and grain-refined zones adjacent to the weld. The parent metal was 1020 steel, and it was welded with a low-carbon steel electrode. Fig. 5 shows a similar weld but at a magnification of 500X. The hardness of the parent metal was 1,110 K, whereas in the heat-affected zone the hardness increased to 2,770 K. Both specimens were Nital etched.

Tests made by author's Sclerometer

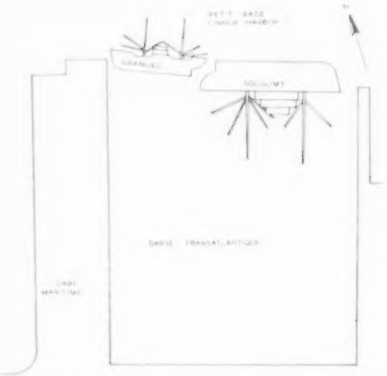
Microscratches made by means of the author's sclerometer through lightly etched cobalt-chromium-tungsten alloy deposited on silcrome are shown in the photomicrographs Figs. 6 and 7. The actual load upon the 136-deg diamond indenter was only 25 grams, and the velocity of scratch was 22 mm per minute. It should be borne in mind that there is a difference in the magnification. When following the scratch in Fig. 6 (magnification 100X) from the top down, it will be observed that the average width is rather narrow in the uppermost area. This is the hard-facing alloy (after etching with Murakami's solution). Traveling downwards, a gradual widening of the trace indicates a decrease in hardness. The differences in the scratch hardness of the welded deposit are even better visualized at higher magnifications. Fig. 7 (magnification 500X) shows a transition zone with the typical change in the width of the scratch. It should be compared with Fig. 6.

Tests at —80 F to 1,200 F

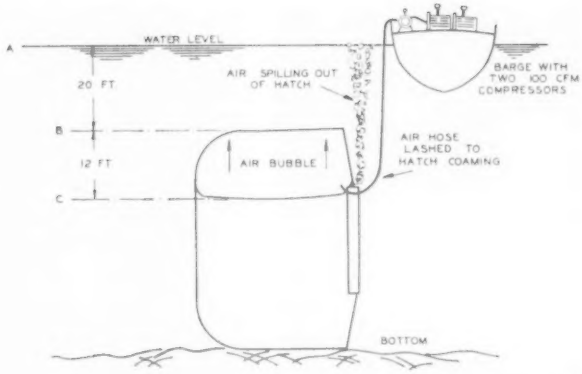
While the foregoing examples were selected at random from the available files, they serve to indicate that more detailed and generally more valuable information may be obtained by similar tests with cross-sectional specimens of many production welds. In order to broaden the scope of this test method, scratch hardness tests are being conducted at temperatures ranging from minus 80 F to as high as 1,200 F.

For samples measuring not over 2 by 1 by ½ in., an insulated small box of welded stainless steel, interior and exterior, was mounted on the platen of the sclerometer. The specimen can either be heated by controlled electric current or cooled by the flow of acetone that has been previously chilled to a desired degree by solid carbon dioxide. Details of the apparatus and technique will be reported at a later opportunity. Even preliminary results, however, seem to indicate that much may be learned of the frictional resistance of materials and welds at various temperatures with a suitable adaptation of the sclerometer.

(*Continued on page 22*)



1—ENTRANCE to deep water slip at Cherbourg harbor was blocked by two sunk ships



2—AIR BUBBLE could help to lift ship, but hull had first to be made airtight. This meant welding on a big patch under water

Underwater Welding

We might have lost the war had the harbor at Cherbourg been denied to us for landing supplies to our troops battling in Normandy. The Germans very carefully sunk two ships to block the entrance to the only slip in the harbor open at all stages of the tide. Underwater welding techniques helped the U. S. Navy to clear out the obstacles. A now-it-can-be-told story about a little known phase of the war.

BY ROBERT H. BURKS
Lieutenant Commander, USNR

THE many ship salvage and repair problems encountered under emergency conditions of the late war required drastic action. Underwater welding was resorted to many times as the most expedient method of getting the job done. Here is one of the success stories:

When We Took Cherbourg

To set the stage, go back in memory to June, 1944, when Allied troops were battling against stiff Nazi resistance in Normandy. Remember the day we took the port of Cherbourg? The Germans, who well realized the strategic importance of the unloading facilities there, had very carefully wrecked everything that even looked suitable for unloading ships.

The *darse Transatlantique* is the only deep water slip in the harbor of Cherbourg that is open to all stages of the tide. The others are in the tidal basins, can be entered or left only at high tide and are kept closed at low tide. The Nazis with their customary Teutonic thoroughness had done an exceptionally good job of blocking the *darse Transatlantique* and its big pier, the *Gare Maritime*. They blasted the pier until its concrete pilings were cracked and shaking. When they left, the slip was filled with wreckage, and the pier's big railroad terminal was a concrete shell full of glass, rubble and wrecked trains.

The slip was blocked at its entrance with two blockships, the *Granlieu* and the *Solglimt*, both sunk and lying on their sides as shown in Fig. 1. To complete the good work, Jerry then sowed seven mines in the *darse* and departed.

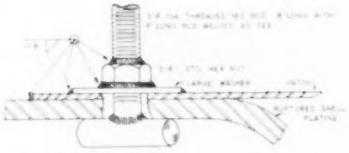
The U. S. Navy Salvage unit drew the job of opening the entrance to the slip. Lloyd's Register of shipping disclosed the comparative size of the two vessels, and a survey made by divers revealed their relative positions in the water. As indicated by Fig. 1, they were sunk stern to stern in about 50 ft of water with the *Granlieu's* top decks and rigging pointing out to sea.

The *Granlieu* was much the smaller ship, a cargo vessel estimated at 2,200 tons light displacement; she was empty save for a few tons of ballast which had rolled down into her starboard side as she rolled over. As she was also the closer ship to the big pier, the *Granlieu* was the logical ship to start work on. The original plan was to refloat her and get her out of the harbor altogether. To cut her up and remove her piece by piece would take far too long.

Refloating on a Bubble

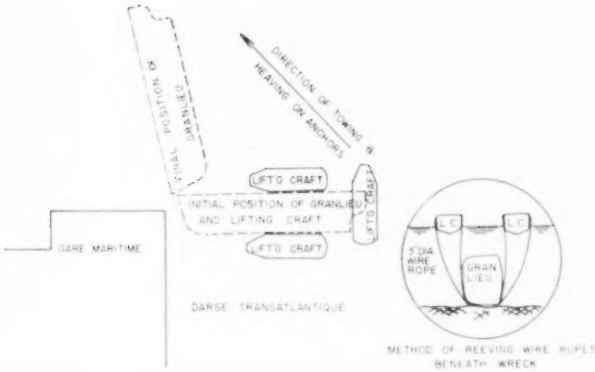
The refloating plan required the use of some British lifting craft (large barges). Each lifting craft has about 600 tons of reserve buoyancy which can be used as a lifting force where extreme tide ranges (as in Cherbourg) are prevalent. To supplement their efforts, an air bubble would be placed inside the hull, as shown in Fig. 2. Large compressors forced compressed air into the ship via air hoses leading through the hatches into the hull.

If air could be pumped into the hull of the *Granlieu* until it spilled out of the main hatches, the bubble, it was estimated, would be about 12 ft deep and give about 1,000 to 1,200 tons of buoyancy. The lifting craft would then have but 1,300 to



3—TEE BOLTS held patch to the hull

4—ANGLE STIFFENERS were placed on outside of patch to keep it from bulging



5—SUNKEN GRANLIEU, lifted with aid of air bubble, was swung about her bow like a huge gate to open up the entrance to the slip

Aids Ship Salvage

1,500 tons to lift, and the vessel, supported by both bubble and lifting craft, could be towed out and grounded on some useless beach.

In order to retain air, the hull had to be made airtight—at least to the extent that air could be blown in at a rate faster than it would leak out. To render the hull airtight, however, was a labor worthy of Hercules. Innumerable poor seams, rivet holes and cracks in the plating had to be plugged, patched, wedged or welded before a 1,000-ton air bubble became a possibility.

A large hole in the shell plating at the bulkhead between number one and two holds was the greatest problem. The intervening bulkhead and the torn and distorted shell plating precluded the possibility of any patching from the inside. It was necessary to weld a steel patch on the outside of the hull.

Need Patch 8 by 12 Feet

In order to reach reasonably fair plating, we had to use an 8 by 12 ft patch of $\frac{1}{8}$-in. mild-steel plate. As it was difficult to handle a plate as large as 8 by 12 ft under water, three smaller plates of 4 by 8 ft were lowered, fitted individually and welded. Ordinary dogs and wedges proved to be inadequate for pulling the patch down to the hull so tee bolts were inserted from the inside. Fig. 3 shows the details of the tee bolt. Two divers, working simultaneously, were required to apply these fastenings, which were spaced at 18 to 24 in. around the periphery of the patch. One diver went down into the hold through number two hatch and floated up inside the hold to the skin of the ship in the area of the patch. The other diver, working outside the hull, flame-cut a hole in the patch and hull with an arc-oxygen cutting torch. The man inside moved over to the spot where he saw the light from the cutting arc and inserted the bolt through the newly made hole. The outside diver then put on the nut and washer and tightened the nut with a wrench. Then on to the next one. It was difficult, dangerous and tedious work.

Question: If the water pressure inside the hull is equal to the water pressure on the outside, what will be the load on the patch? At first glance it appears there would be no load, but this is superficial thinking. When the hull is full of air, the water pressure at the top of the bubble is lower than the water pressure at the bottom of the bubble. It is easy to show why this must be so.

In Fig. 2, the gage pressure at line "A" is zero psi. As water pressure increases approximately 0.45 psi per foot of depth, the water pressure at line "B" is 20 ft x 0.45 psi per ft = 9 psi. Water pressure at "C" = (20 + 12) ft x 0.45 psi per ft = 14.4 psi.

The pressure inside the air bubble is not only equal throughout, but it must also be equal to the water pressure at the lowest extremity of the bubble: in this case, 14.4 psi. The skin of the ship lying at depth "B" is acted upon by the outward force of the water pressure at 9 psi and the inner force of the bubble at 14.4 psi. The differential pressure of 5.4 psi acts outward upon the patch and tends to push it off the hull. Simple arithmetic shows that an 8 by 12 ft patch has an area of 13,824 square inches. At 5.4 psi, the total force acting to blow off the patch amounts to over 37 tons.

In order to prevent the patch from bulging and overstressing the welds, six angle stiffeners, spaced 18 in. apart, were placed on the outside of the patch as shown in Fig. 4. The angles were of various sizes as they were salvaged from the wreckage in the French Navy Yard. Care was taken, however, that none had a section modulus of less than 0.33. This limit was set on the basis of a 10-ft span and a maximum force resulting from a 12-ft depth of bubble (12-ft head of water or 5.4 psi), assuming a maximum allowable stress in the angle of 30,000 psi.

Electrodes Waterproofed

All welds were made underwater at depths of from 15 to 40 ft depending upon the tide. The electrodes

were of the E-6011 type and were treated for underwater welding by dipping them several times in ucilon and permitting the rods to dry between each dip. This treatment waterproofs the electrode so that its coating is unaffected by submergence. Electrodes so treated may be taken down by a diver, brought up again, dried in air and then used a day or even a week later.

It is generally conceded that the E-6013 type of electrode is superior to the E-6011 for underwater work, but this type was not available to us. The results obtained with E-6011 electrodes were satisfactory; the only improvement might have been in arc characteristics.

The generally accepted underwater technique is to use small-diameter electrodes (1/8 and 5/32 in.) and hold a close, almost dragging arc with no weaving. All welds should be made with the electrode negative (straight polarity) to avoid electrolysis of the holder and to concentrate the heat in the puddle in order to keep it molten as long as possible. The surrounding water acting as a quenching agent, freezes metal and slag very rapidly. A weaving technique is banned, therefore, because it would allow a portion of the weld to freeze as the arc is diverted on the weaving motion. The weaving rod, returning on its back stroke, would then deposit new material over solidified steel covered with slag. The result would be a porous weld as the underwater arc cannot produce a molten crater sufficiently hot to float out previously solidified slag.

The welder used was a 300-amp gasoline-driven d-c generator. It was carried on board the diving boat and the ground lead was clamped directly to the wreck. The leads were about 50 ft. long. Welding current for 1/8-in. electrodes was about 160 amp and about 200 amp for 5/32-in. electrodes.

A conventional-type holder was used, with all exposed parts taped to reduce electrolysis. A special holder for underwater welding was under development by the Navy but was not available at the time.

All of the welding was done in the downhand or horizontal position. The total job included welding of the periphery of the patch, welding the two seams between the 4 by 8 in. plates, putting seal beads around every washer, every nut and every bolt used to pull the patch into place.

About 175 hours of diving time were required to complete the patch. All the divers that worked on this job were good topside weldors as well as excellent divers. Here, as in every salvage job undertaken by this crew, the success of the job was largely due to the skill of the divers.

Pumping in the Air

After the patch was completed, air was put into the hull. All of the seams leaked at first, but the air bubbles located the leaks for the divers. The holes were soon welded up and the patch made airtight. Then other leaks began to be apparent—small hatches and vents in the deck began to leak as the patch permitted a bigger bubble. These leaks were patched too, but it was impossible to get all seams 100% airtight as the deadline was approaching.

The big patch was only part of the total job of getting the wreck ready for lifting. Another crew of divers removed masts and booms and passed heavy wire ropes under the wreck. When all was ready, two lifting craft swung into position to pick up the wire ropes slung under the wreck. At dead low water they heaved in the slack on the ropes while the compressors blew air into the wreck. As the tide rose, the lifting barges strained at their slings. Nevertheless, the first attempts at lifting failed. It was evident that the original plan to move the hulk to another beach was impractical because the total lifting power was not great enough to lift it clear of the bottom.

The plan that succeeded was to swing the *Granlieu* about like a gate, using her bow as a pivot, and thus open up the harbor. Fig. 5 shows the final position of the wreck. The stern was lifted—this time with three lifting craft and the bubble—and the sunken boat swung about to clear the entrance to the slip. The lifting craft, having no motive power, heaved with their steam winches on the cables of two heavy salvage anchors, which had been previously laid out in the direction of the pull. Five tug boats supplied additional power. With compressors pumping, winches hissing and screws churning, the entire cumbersome assemblage was swung to seaward—an enormous gate opening the Gare Maritime to Allied ships and victory.

SCRATCH HARDNESS TESTS

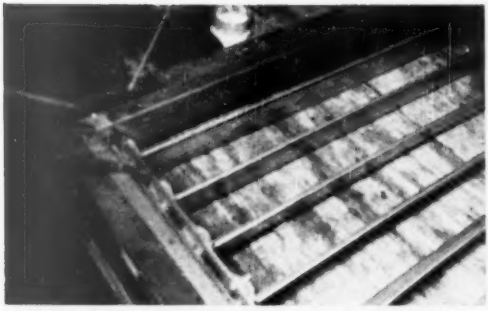
(*Continued from page 19*)

In spite of the advantages of sclerometric studies, very few control and research laboratories have given serious attention to this phase of modern hardness testing. One of the probable reasons for this negative attitude is the admitted and often publicized difficulty of establishing a convenient scale of scratch hardness—a scale which can readily be converted into Vickers, Brinell or Rockwell hardness values. Reliable computations of these relationships may only be attempted if all factors affecting indentation and scratch hardness tests are known exactly and are maintained when making the determinations used for later diagrammatic correlations. With such diagrams, it is then possible to comprehend actual values of hardness together with their implications rather than to reply on some unknown terminology.

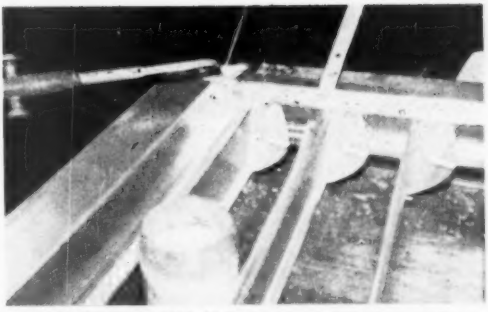
Practical Procedures Needed

The present investigation of the possible use of a modern sclerometer for testing weld hardness has brought about renewed interest in the basic variables involved in making reproducible micro-cuts. The experiences gained from this work justify consideration of practical test procedures by which changes in the hardness of welded areas may be ascertained and by which relationships between such changes and essential refinements in welding technique could be established. Six of the conclusions reached in similar studies with manually and automatically produced weld specimens are expressed at the beginning of this article.

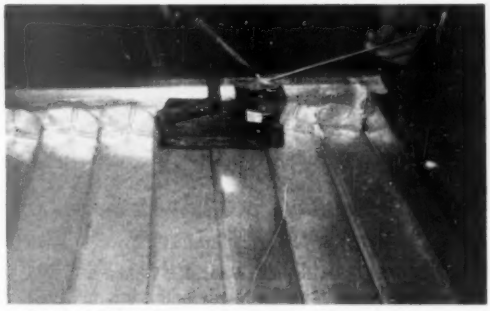
Much remains to be done before the sclerometer is introduced to welding laboratories as a generally more useful tool for control and research of manufacturing methods. Nevertheless, engineers may derive from scratch hardness data vital information pertaining to such diverse properties of welds and metals as resistance to plastic deformation, resistance to cutting, resistance to abrasion, resistance to scratching and indentation, etc. Yes, scratch hardness tests are of considerable interest and undisputable value.



AWNING FRAME in jig while a corner is being welded



WELDING ROD AND FLUX are used to join members



FOUR BRACKETS are welded onto frame for fasteners

COMPLETED BLINDS fit over window and door screens

Gas Welding Aluminum Awnings

Problem of too much spoilage was solved by welding at low temperature, without melting base metal. Burn-throughs were eliminated and touch-ups avoided

METAL AWNINGS that look like venetian blinds are doing a great deal to make southern homes more comfortable. We quote from the advertising of the Air-o-Blind Metal Awning Co., Tampa, Fla., the big operator in this field:

"Air-o-Blind rooms are easy to create and even easier to live in. At a finger touch...wide open when the weather is fine, to reveal all the beauty outside. Tight enough to keep out rain but let in refreshing breezes. Cleverly curved to reflect summer sun when there's too much. And sturdy enough to resist a hurricane!"

Sounds like a pretty good gadget, doesn't it? What it is, basically, is a series of horizontal louvers mounted on the outside of window and door screens, porches or "breezeways." It differs from old-fashioned canvas awnings in that it is adjustable from inside. Like cloth awnings, however, the Air-o-Blind is custom built for each particular job.

Large quantities of 1/16-in. 24ST aluminum sheet and 1/32-in. 3S aluminum sheet are used in the manufacture of Air-o-Blinds. Top and bottom headers of aluminum are welded to side angles to form a strong one-piece frame. Four brackets are welded onto this frame as fasteners. So far the best welding method has proved to be good old oxyacetylene welding.

The fusion welding of thin aluminum is no job for any but experts. Air-o-Blind was experiencing a work-spoilage rate far too high for profit. The company besought the advice of one of its welding equipment suppliers, General Auto Supply Co., Inc., a Tampa distributor.

General Auto Supply put a technical man on the job of experimenting. Many methods were tried, but the most likely was a weld made at a low temperature with a proprietary aluminum rod and flux. Even with inexperienced weldors Air-o-Blinds began to be made without any burn-throughs. Every one of the eight welds required per blind had complete penetration and none needed touch-up. The color match was excellent; the weld strength greater than that of the base metal. Welding time per blind dropped from a half hour to less than five minutes.

The secret of it all is that the weldor no longer has to melt the base metal to achieve a weld. When his flux melts, he knows he has all the heat he needs; he then applies the rod, and capillary action takes care of the rest.

Photos courtesy All-State Welding Alloys Co., Inc.

FIRST WELD is made as soon as 30-ft lengths can be aligned. Pneumatic rollovers will propel pipe out of jig

SECOND WELD is also made manually. Weldor uses foot control to revolve the pipe slowly as he lays his bead

"Double Ending" Saves

Two identical assembly lines at the Santa Clara plant of Bechtel Corp. introduce production methods, including automatic welding, to pipe-line construction. "Double ending" or joining two 30-ft lengths of pipe into one 60-ft length cuts field welding in half

THE PROCESS of "double ending" is relatively new in pipe-line work. To reduce it to simplest terms, the pipe produced by the mills in normal 30-ft lengths is quickly turned into double lengths by a combination of machine and hand welding. These welds are made before the pipe is at the trench. Much welding time is thereby saved, and pipe handling is cut down.

Continuous Production

Sounds easy, doesn't it? A look at the Bechtel Corporation's plant, located just off the Bayshore Highway near Santa Clara, Calif., would change your mind. Big trucks bearing eight lengths each of 34-in., 30-ft pipe from the steel mill in the San Francisco area come in an endless stream, drop their loads and go back for more. Even bigger trucks, 16-ton Diesel tractor-trailers, pick up five 60-ft lengths each and carry them to the job site out near Hollister, Calif., where the Pacific Gas and Electric Company's new "Super Inch" line is being laid.

At Santa Clara, there are two identical assembly lines. The pipe is delivered ready for welding, with a clean 30-deg bevel on each end. The lengths are unloaded from the incoming trucks by fork-lifts and placed in pairs on level roll-down rails. The pairs of pipes are rolled down to the first jig, where they are mated and aligned.

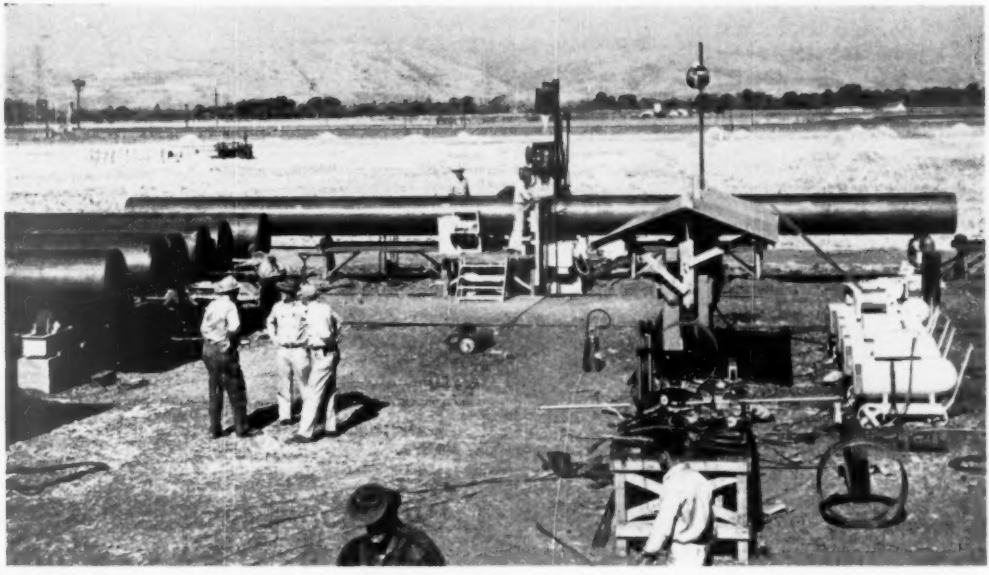
Correct spacing and perfect alignment are assured by a unique device. This is an electric "bug" that creeps down the pipe under its own power and forms a bridge between the two sections being welded. Once in place, it "swells up" and brings the two pieces in line while leaving an exact 3/32 of an inch space between the ends.

Two manual arc weldors lay the first bead; the "bug" crawls out and hydraulic lifts remove the two pipes, now one, to another set of rolldown rails, similar to and in line with the first storage rails described.

Second Manual Weld

Another welding jig is entered. This time, since the pipe is permanently aligned, the welding is carried out by one weldor with a foot control. The latter device allows him to revolve the pipe slowly as he lays the second bead. While he is welding, his assistant removes the flux of the first weld before him and the flux of his own weld after him with a portable electric buffing wheel.

Released from this jig, the 60-ft pipe is ready for its final machine weld. Our front cover shows the welding head, which automatically



THIRD AND FINAL weld is made by submerged-melt process. Flux and welding rod are applied automatically as the pipe revolves (see front cover for close-up of the welding head). Joint is 70% stronger than parent metal

Welding Time, Cuts Handling

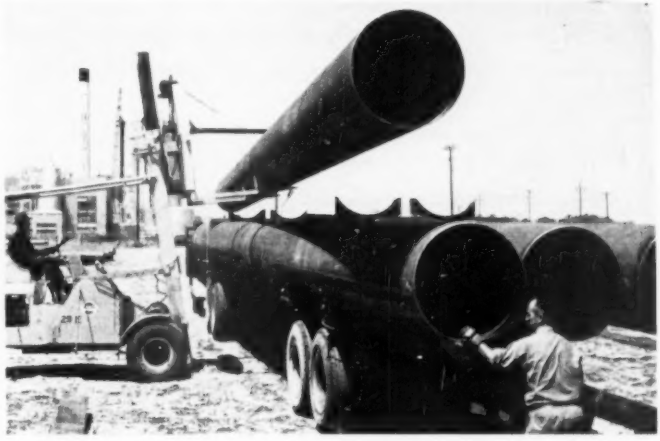
applies flux and welding wire while the pipe is revolving at the prescribed rate. Voltage is low, around 28, but the amperage is as high as 580. The deposit is a strong, thick layer of metal, which fuses the seam and results in a final connection some 70% stronger than the parent metal.

The final bead is okayed by P. G. and E. inspectors, and the pipe is conveyed on electrically driven rollers to the final storage rails to await shipment to the job site. Again, fork-lifts are employed to load the outgoing trucks.

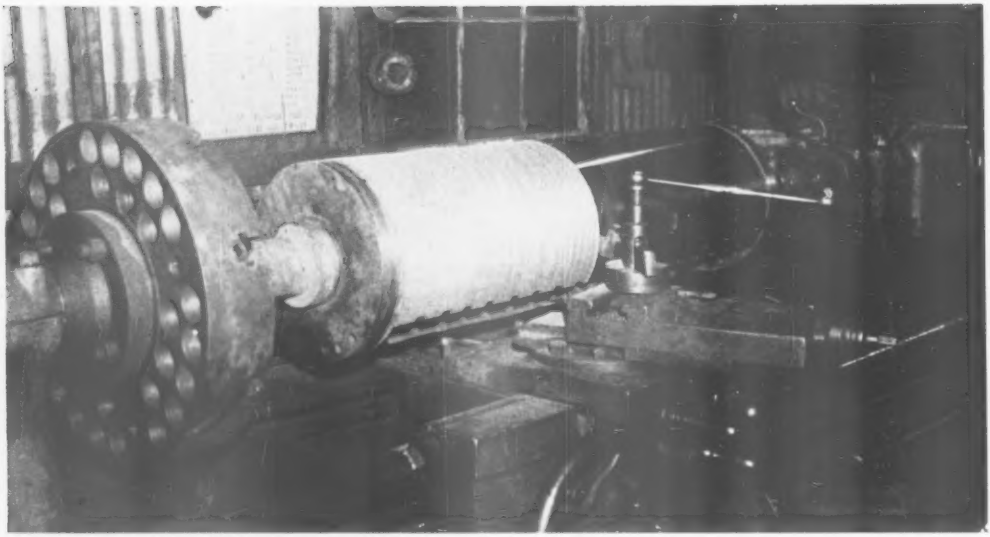
Gamma-Ray Inspection

Samples are taken at intervals from the stock pile for gamma-ray inspection. As in X-ray inspection, a strip of photosensitive film is wrapped about the seam. A radioactive source produces the penetrating rays. The record on the film is a "shadowgraph" of the structure of the weld.

The work of double ending is performed under the direction of Bechtel Vice-President V. G. Hindmarsh and field personnel under the direction of Division Manager Al Orselli. E. F. Quiett, field superintendent, came all the way from Arabia to make the double-ending set-up for the "Super Inch"; during his temporary illness, Dick Smith, assistant superintendent, was in active charge. Other men who should be mentioned are: Fred Yost, foreman; Ernie Guard, office manager; and Russell Rhoades (a real veteran in the pipeline field), welding supervisor. With a crew of forty, production is around 100 welded lengths per day.



FORK-LIFTS LOAD the completed 60-ft sections onto trailers for shipment



ROUGH CUTTING CYLINDER IS TURNED down in a lathe to provide a rough, clean surface on which sprayed metal can bond. It is one of three cylinders 14 in. in diam by 6 ft long

Metallizing Renews

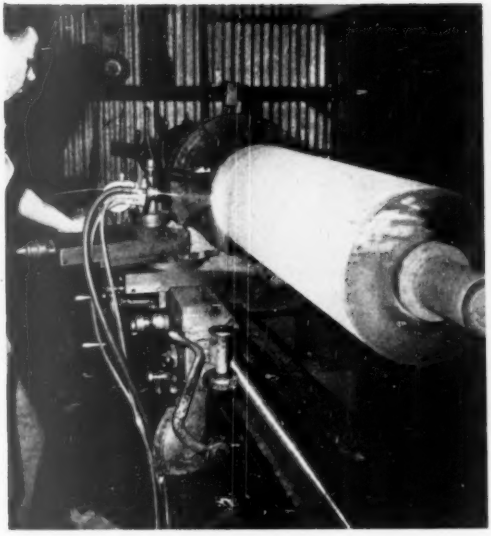
- **The renovated cylinders give accurate reproduction, produce the high quality of work expected and demanded by today's printing customers.**
- **Cost of metallized build-ups was under half that of new cylinders.**
- **Press downtime was minimized.**
- **Excess metal could be easily cleaned out from areas where it wasn't wanted.**
- **The metallized surfaces stand up. Even when an iron quoin accidentally went through the press, little damage was done.**

BY ELTON STERRETT

THE three 14-in. cylinders of an S8L, size 28x42 Harris offset press for lithographing in the plant of the Steck Company, of Austin, Texas, were found to be undersize and worn. It should be noted that wear on the cylinders rapidly affects the accuracy of the reproduction done by an offset press, and the quality of the work produced quickly falls below the exacting standards set by the printing industry and expected by its customers.

Normally, the defective cylinders would have been scrapped and replaced by new factory units. The Houston plant of the Metallizing Company of America, Inc., however, sold the printing company on the idea that the worn cylinders, bearers and journal bearings of this press could be built up by metallizing. The job was done at a cost under half that of new cylinders and with a minimum of downtime for the press.

ROUGH CUTTING: Though the cylinders differed in dimensions, the operations on each were the same. A cylinder would be centered in a lathe large enough to swing the 44-in. working surface, and roughing cuts were made with the point of the lathe tool set above the centerline of the cylinder. These cuts were run over the face of the cylinder, the two bearers and the journals until all wear had been removed. The work required more than the usual care in order to attain a grease-free background upon which the new metal could be sprayed. Ink absorbed into the minute pores of the original casting had to be thoroughly gouged out by the lathe tool, or the residue would expand and "sweat" under the heat of application of the new metal.



BUILD-UP **SPRAYED METAL builds up coat to the desired roughing diameter**

GRINDING **WORKING FACE is ground to a plus or minus 0.0005-in. tolerance**

Offset Press Cylinders

ADDING NEW METAL: When the cylinder had been trued and prepared for spraying, the new metal was applied. Spraying was done as quickly as possible in order to avoid contamination by dust or moisture of the roughened surface. Despite the undercut area in those cylinders carrying gripper fingers, the metal was sprayed on to a uniform thickness of approximately 0.008 in. above the desired finish dimensions of the three portions (or different diameters) of the cylinders. To avoid eccentric laying of the new metal, spraying was done in the same lathe used for turning and roughening of the cylinders. The gun was mounted on the lathe tool post and traveled at relatively slow speed while the work was revolved at 60 rpm.

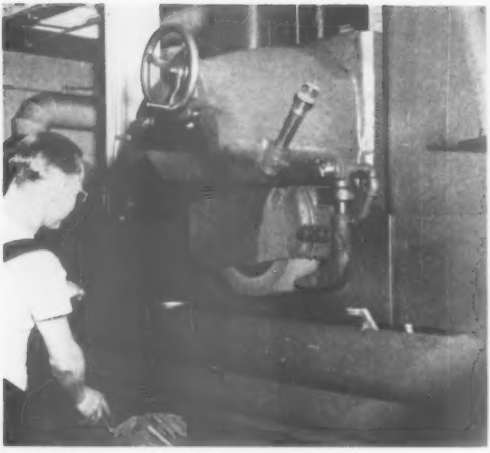
GRINDING: The grinding operation involved five diameters, which had to be attained to insure exact running of the cylinder when they were replaced in the press. At each end of each cylinder was a journal bearing, 4 in. in diameter by 5 in. long. These bearings carry the cylinder on the idling—or non-printing—portion of its work cycle. Diameters of the three cylinders were slightly different because of requirements of the printing process. The body of the plate cylinder was turned to 13.956 in., that of the rubber blanket cylinder to 13.845 in. and that of the impression cylinder to 13.992 in.

At each end of each cylinder, and separated from the working or printing-process area by a narrow undercut groove, is a 2-in.-wide strip known as the bearer. It is the function of the bearers to maintain the alignment and position of the cylinders during the printing cycle. The three sets were finished to 13.996 in., 14.000 in. and 13.992 in., respectively. Tolerances on the grinding of cylinders and bearers had to be held to 0.0005 in., plus or minus.

Success in attaining the desired true cylindrical surfaces and three critical diameter dimensions was aided to a large extent by the accuracy and uniformity with which the build-up was done by the metallizing process. The cylinder revolved at 60 rpm in the lathe, and the carriage traveled at correspondingly slow speed. An average of 0.008 in. was built up at each pass of the gun over the work. The carriage was released and run back to the extreme left of the workpiece before beginning a new pass.

No attempt was made to clean—or reach bright metal conditions—in the recesses of the cylinders, and hence any sprayed metal reaching these areas could be easily removed at the close of the spraying process. The metal built up over the well-inked surfaces not touched by the lathe tool lacked bond and could be pried out in large flakes with a screw driver or ice pick. It was completely cleaned out by wire brushing and air jets. This supplemental cleaning was done before the grinding in order to avoid any possibility of accidentally marring the finished surface.

SERVICE RECORD: In service for over a year since the renewal process, the metallized cylinders are today behaving excellently. They even withstood the passage through the press of a malleable-iron quoin or wedge, which had been left in a bad spot when the press accidentally started. The only damage was to the immediate area contacted.



1—TOOL ROOM has seven departments and modern equipment, including a grinder with a 6-in.-wide wheel

2—PUNCH AND DIE plates are assembled by matching color system at big savings in tooling investment

Modern Shop Practice

Lindemann & Hoverson, Milwaukee, showed no profits for ten years. Before it could be counted out, however, the company reorganized and has been in the black since 1941. From tool room to shipping crates, L & H range production follows the most advanced methods

BY GERALD ELDRIDGE STEDMAN

(Photos by Marge Stedman)

PRODUCTION welding can result in virtual miracles in the rejuvenation of obsolete plant practices. This is proved again by the present thrust of expansion which has successfully characterized the activities of the A. J. Lindemann & Hoverson Co., Milwaukee.

Twelve years ago, after a half century's history, this company was down and expected to be out. Now it is one of the challenging producers in the electric range and automatic water heating business. The extensive centralization upon production welding in its advanced shop practice has played a considerable part in the L & H rejuvenation.

Ten Years in the Red

Organized in 1875, a venerable oldtimer in stove production, L & H fell upon bad times in 1929 and for the succeeding ten years was unable to show a profit. In 1937, a disastrous labor dispute, which dragged on for seventeen months, challenged the ability of the company to survive. That disaster, however, caused the management reorganization from which the plant dates its later growth.

The Way to Profits

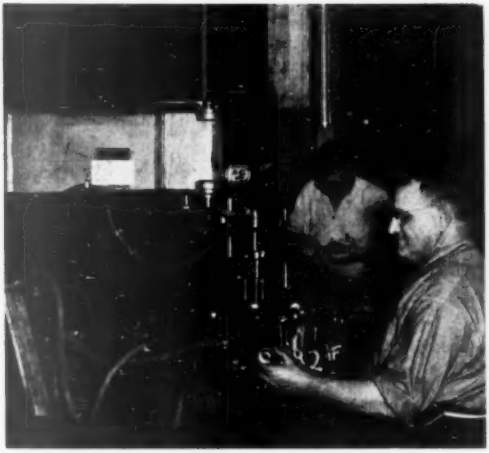
Taking over the management in 1939, E. A. Lindemann, present president and general manager, installed drastic reorganizations and modern shop practice. He influenced H. J. Berman to come with the company as executive vice-president and works manager. Berman had had a notable shop success for over eleven years with Edison General Electric Appliance Co. (now Hotpoint, Inc.) as chief of its planning department. Both these men are as technologically advanced in shop practice as any management minds I have met among my 1,079 plant visits since 1942.

A fourth of the company's production is in oil ranges, oil heaters, portable ovens and wicks; 75% in electric ranges and electric water heaters. Since 1941 Lindemann & Hoverson has been in the black. Its labor situation is authoritatively stated as now being the best in Wisconsin.

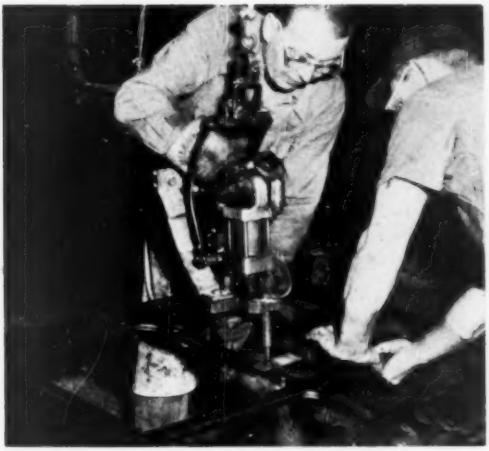
The L & H plant is equivalent to 500,000 sq ft under one roof, its 17 buildings having been skillfully integrated by conveyor systems. Maximum straight-line production is thus attained from an admittedly poor layout as modern plant design goes. More about this later on.

Sheet-Metal Department

The sheet metal and welding operation accomplishes a very high production per square foot of factory space, and the layout is the simplest I have ever seen. The entire department occupies a 45 by 75 ft space, and L & H succeeds in getting 400 range bodies per 8-hr shift from it.



3—SPOT WELDING is widely used. Here a valve stem and wheel are being united by welds instead of rivets



4—WELDING GUNS are used individually. Multiple-welding equipment is objected to as "too complicated"

for Modern Ranges

This could be increased but happens to be the maximum capacity of final assembly.

Production welding begins, properly, with the making of the necessary jigs and fixtures. L & H has a modern tool room which produces practically all of its tool and die work, including all tool repairs. (It does go outside for its tooling on large programs.) A staff of 20 is maintained in the tool department. Tool-room equipment is unusually complete. One grinder (Fig. 1) with a 24½ by 75 in. bed and 15-ft travel uses a 20-in. diameter wheel, 6 in. wide. There are: eight divisions of grinding (all grinders being exhausted with latest equipment); shaper, planer and milling set-up; assembly benches for each tool maker equipped with vise and fluorescent lighting; saw and radial drill department; lathes; a precision layout table; a repair die area with unusual room to take dies apart and, finally, heat-treating facilities.

Persistent devotion to precision is noticeable throughout the L & H plant. Not only are tooling activities laid out on a precision table, but there is a precision table in control of all punch work. The first piece run on any new die set-up must be okayed by the layout inspector with precision instruments at this table, and the last piece run must be checked upon it for die repair before being returned to storage. This same fidelity to precision runs through all of the departments of the L & H plant.

How Dies Are Assembled

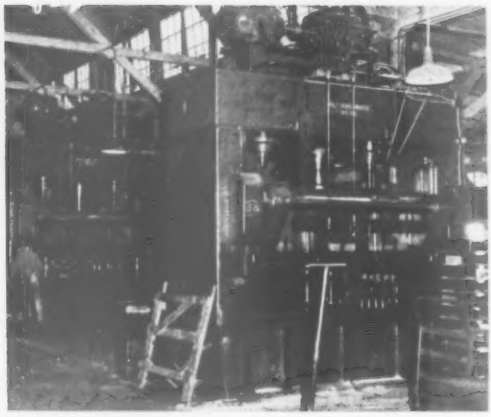
Much of L & H tooling practice shows significant distinction. An excellent example is the unusual method of assembling punch plates and die plates (Fig. 2). A variety of perforating and notching dies in an extensive range of die diameters is maintained on a color key system. The matching colors are keyed on both punch and die plate. The proper perforating or notching dies are quickly selected and assembled on these plates, then doweled in. This technique affords an inexpensive way to build big dies. As many as seven separate operations can be performed in one hit by dies assembled by this method. At the end of the run, the die plates are disassembled and indexed for storage, and the varied dies are returned to inventory. New dies are made up as needed. The system saves a considerable investment in tooling.

Heavy box jigs of the turret type, which rotated, revolved and turned on a circular track, were formerly used for welding. These cumbersome welding jigs have been replaced by light locating strips of less than ⅛-in. thickness. Actually, L & H is using its production department for this sort of tooling, providing a considerable reduction in labor and material cost. Such fixtures simplify production; the lighter fixtures give greater mobility and ease of handling, quick locating and better accuracy because of the improved tolerance.

Experimentation is now being made on magnetic holds and stops, with which it is intended to do away with clamping and screw fixtures. If successful, this will effect another noticeable saving in tooling practice.

Welds Displace Rivets

Production welding, used wherever possible, has displaced much former riveting practice. For example, the valve for the oil stove is now being fabricated at the rate of 500 per hr by the use of resistance welding. This assembly consists of a ¼-in.-diam. valve stem and wheel (Fig. 3). The



5—HYDRAULIC PRESSES of 250 and 150 tons form range bodies in a series of blank and draw operations

6—AFTER FORMING, body "flats" are bent into U-shape. Two sides are bent with one jigging, as shown

From forming to final assembly, bodies follow a carefully planned schedule

stem is milled and the wheel shaped to fit. The assembly is flattened during the heat of welding. A 35-kva, electronically controlled spot welder is used with fixtures of L & H design. The lower electrode is split and clamped by air pressure with a foot-operated release. This fixture gives a concentricity which was never uniformly possible with the old riveting method.

After the current, pressure and cycle have been determined for each job, the control is automatic. Destruction tests are regularly made with slugs pulled for weld test. The trouble of having a weld break is unheard of in the field. Quality is accomplished not only by the automatic controls set up, but by close supervision by welding experts. Gun welders are used at single stations (Fig. 4), and no attempt has been made to develop automatic multiple welding. It has been the observation of plant technicians that too complicated automatic controls are much and often out of order.

Forming Range Bodies

Perhaps the best way to illustrate properly L & H production welding technique is to discuss the fabrication, welding and assembly of an electric range body. Previous work is accomplished in the punch press department to make ready for drawing and blanking press work. Having been previously perforated and notched in the flat, the 36 by 89 in. 18-gage vitreous sheets are delivered by jeep in 100-sheet quantities to the draw press platform in the sheet metal department.

The first press operations (Fig. 5) are accomplished on a 150-ton hydraulic press, using a progression of two dies for blanking and drawing. The work on this 150-ton press is to blank and draw two front openings. The blank and draw dies are in tandem position on the press bed. The work receives two blankings and two hits, using step gage; the procedure is to hit and advance in the blanking, and the work moves right to draw. The draw is ¾ in., and the final draw dimension is 23½ by 32 in. Two operators are used, and the press will not perform unless both actuate the release cord. Production is 150 pieces per hr, each hit producing one piece.

The action on this press is to remove one body from the blanking die and place in the forming die, remove one body from the rack and place in the blanking die, blank and form, move two bodies to second position in the two dies, blank and form second opening, remove the body from the forming die and pile on the floor against the conveyor for the next operation. The other operator greases the opening.

The work moves to a 250-ton press to draw the four sides, flange the body all around and form a toe opening. A ¾-in. flange is involved. The press uses two operators; the action is to insert the body on the die, pull the two release cords and flange. The work is removed from the rear of the press and moved to a storage rack. The final dimension of this piece in the flat with such forming is 34½ by 87 in.

Die storage for the big presses forming the body is by press side. Most of the work is handled by jeep. Tote boxes are standardized; they have steel channel iron shelves of welded construction and corners arranged for mating stack.

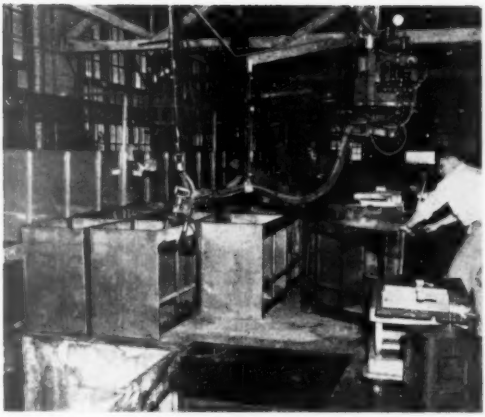
From the big presses, the work moves to an interesting jig (Fig. 6) where the body is formed into U-shape by bending two sides in two operations with one jigging. It is now ready for the welding line.

Assembly by Welding Guns

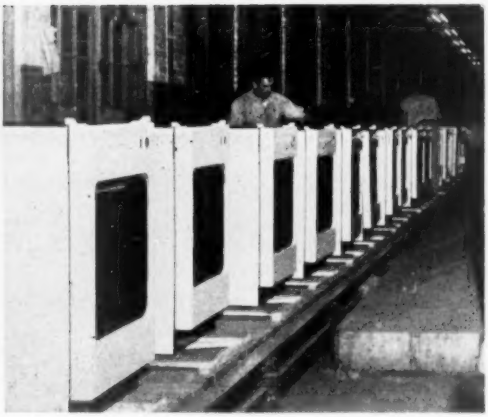
The welded fabrication of the electric range body involves the assembly of the following:

(1) Body;
(2) Back;
(3) Upper front gusset;
(4) Lower front gusset;
(5) Rear upper gusset (both left and right);
(6) Oven door strike;
(7) Cross brace.

The successive welding operations, very highly simplified, are accomplished by two operators using a battery of five 50-kva overhead, swing-around spot-welding guns



7—WELD ASSEMBLY is done with five 50-kva guns, precisely controlled as to current, pressure and cycle



8—FINAL ASSEMBLY flow proceeds along 32-station production line. Range models ride on crate bottoms

(Fig. 7). Quoting from the condensed routing sheet of this assembly, the operations are:

Obtain body from storage; place in brake; secure two clamps on brake two sides 2X; remove clamps and place body on floor; jig four-hinge housing supports in two jigs; place one with chill plate and spot weld two supports 6X; remove and aside jig; get second jig and place with chill plate and spot weld two supports 6X; remove and aside jig and chill plate and place body aside for next operation; load jigs, two supports each; dress tips; get hinge housing supports to bench helper for operation.

Get all parts to bench; place body at work station; get the back and place in body; get jig and locate; get two upper front gussets and place; spot weld back to top rear 3X; place and spot weld top front gusset 6X; position and spot weld second front gusset 6X; spot weld back to rear corner 3X; remove and aside jig; invert body; get and position jig; place two bottom front gussets; spot weld back to lower rear corner 2X; place and spot weld lower front gusset 8X; spot weld second lower front gusset 8X; spot weld back to corner 2X; remove and aside jig; get two cross braces and place and spot weld 8X; get one cross brace and spot weld 4X; invert body on front and spot weld back to side 9X; shift and spot weld back to other side 9X; invert body and remove to storage; return to work station; dress tips.

Finishing Operations

Final operations on the body are metal finishing to remove the weld spatters, kinks and splotches, and to accomplish whatever disc, stone and sand grinding and polishing are necessary to pass inspection. These are detailed as follows:

To straighten and finish, move body to work position and invert; disc grind four bottom corners and brake edges on body sides; invert body and disc eight spot welds and four corners on three sides of body; invert body and disc four top corners and two rear side corners; invert and check end for scratches; stone and sand end as required to remove burrs; invert body and inspect and stone and sand second end; invert body, inspect, stone and sand front to remove burrs; invert body, gage and hammer square front of body; remove finished body to storage to pass inspection.

After inspection, the range body is placed on a 1,700-ft conveyor, which moves part of the way in open air, over and around varied buildings, to be carried to porcelain enameling and then to final assembly.

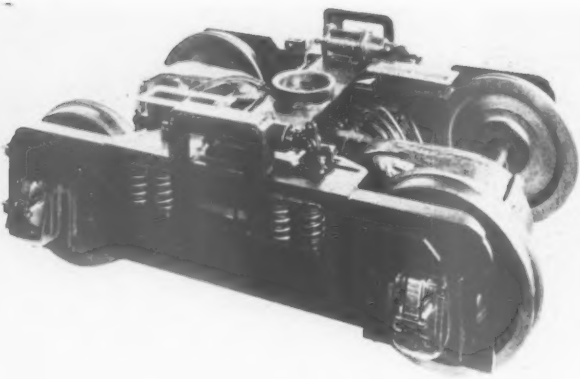
Nowhere than in this conveyor movement is better illustrated the unique way in which L & H has overcome the inconvenience of a number of heterogeneous buildings. Where it crosses open air company streets, the conveyor is protected by a bottom grill work to prevent accident to those below.

Pickling and enameling operations merit a few words. A feature of the L & H pickling technique is its electric cleaning. A current of approximately 1,800 amp at 5 volts is used, with the work as anode. The load baskets have copper contact bar suspension to provide the cathode. Pickling is done in a tandem line of eight pickling tanks.

The new L & H porcelain enameling shop has many unusual features: easels, dip coating techniques, burning chain travel, firing of dip and ground coats in the same furnace, inspection procedures, even the recovery of dip-coat overrun. The enameling procedure is outstandingly modern and efficient. Bodies can be sprayed to go directly into the dryer from one direction or the direction of the conveyor travel can be reversed, as is done when one-piece oven linings are to be processed.

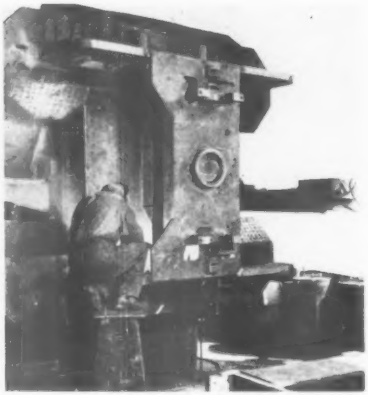
Final assembly flow (Fig. 8) proceeds along a 32-station production line. The range bodies ride on crate bottoms, and subassembly details are organized at right angles to the line flow for convenience and efficiency.

Currently, L & H employs 525 workers, has a supervisional ratio of one to 21, an accident frequency of 5.6, an indirect-direct cost ratio of 60%, a scrap ratio to net sales of 0.75%, material handling costs of 11.3% to total indirect costs, a rework record in its porcelain enameling shop of 2.8% of direct labor standards. These data well indicate the abilities of the company's present management.



TRUCKS

1—SWIVEL TRUCK for a 44-ton switching locomotive. Most Diesel locomotive designs employ swivel trucks



2—SIDE FRAME and bolster parts for truck are finished welded on a positioner

BY E. F. McCALEB
Locomotive Engineering Div., General Electric Co., Erie, Pa.

Building Diesels

- **Building one piece upon another, like a brick house, did not lead to efficiency in the production of Diesel-electric locomotives. Assemblers, weldors, pipe fitters and wire men were continually getting in each other's way.**
- **New method is the "unit assembly" principle in which the locomotive is made up of several standardized assemblies. Operations are segregated, and the efforts of each group of workers are unhampered.**
- **Result: a better constructed product and one that's more accessible for maintenance. Cost reduction also followed.**

IF THE DIESEL-electric industrial locomotive is considered as a unit assembly problem, it breaks down into the following divisions:

Trucks
Platform or bed
Main cab, further subdivided into
  Cab base
  Control cabinets
  Operator's cab
Engine cab

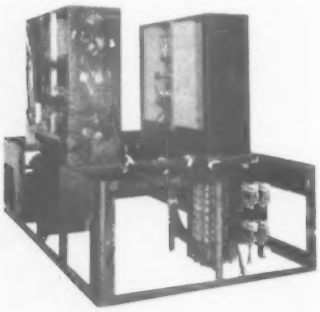
Each of these assemblies is composed of many pieces brought together and welded. It is subject to the usual variations brought about by shop tolerances and distortion resulting from the heat of welding. The successful application of the unit assembly principle to so large and complicated a structure requires a considerable number of jigs and locating fixtures to insure satisfactory fitting of the various parts in the final assembly.

We made jigs and fixtures as simple as possible and took advantage of systematic standardization of individual parts over the entire line. For instance, we adopted a side sheet of the operator's cab including all window openings. This standardization allowed us to provide a blanking die for the window openings, thereby reducing the cost and resulting in a greatly improved product.

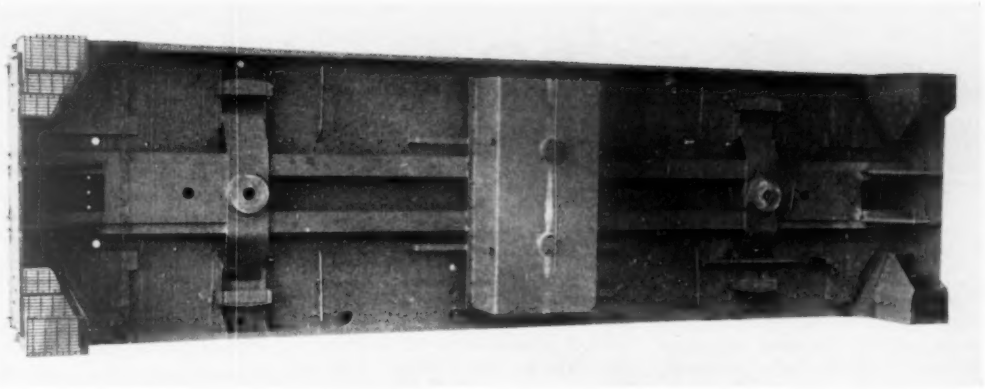
Our overall program considered no part as too small or insignificant to be studied. For example, we designed a standard handrail foot which could be applied wherever handrails are used on the locomotives. This immediately resulted in sufficient production to warrant a forging die to form the foot, again giving us a superior product at a reduced cost.

Uncoupling levers had always looked as though they were added as an afterthought. We gave the product some study and adopted a standard which blended with the rest of the design. A bearing was chosen which could be drop forged and are welded to the end frame of the platform before assembly. This gave a much better appearance than formerly and, at the same time, resulted in a substantial reduction in cost.

CONTROLS



4—ASSEMBLED control cabinets are set on the cab base and bolted



PLATFORM 3—UNDERSIDE of the underframe or platform for 65-ton industrial Diesel-electric switching locomotive. The platform is clamped to a floor plate and assembled in an upside-down position

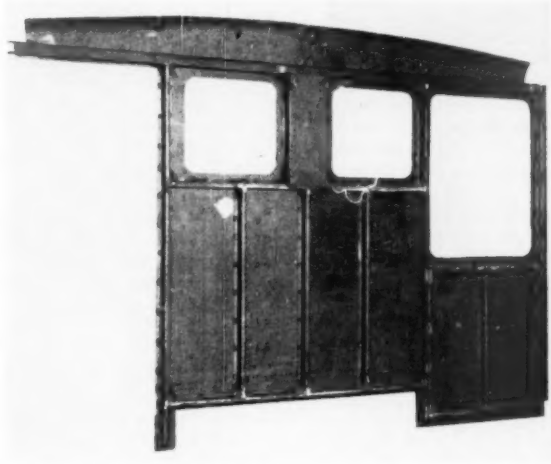
by Unit Assembly

TRUCKS

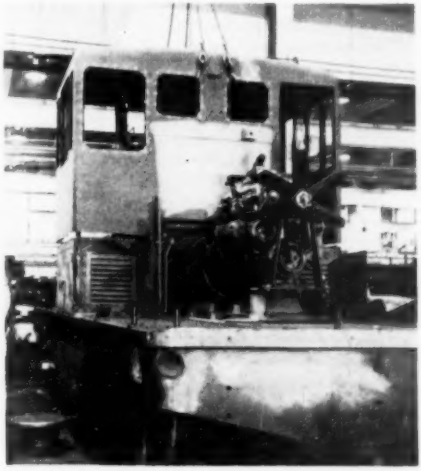
GREAT MAJORITY of industrial Diesel-electric locomotive designs employ swivel trucks (Fig. 1). With this type of construction, there are only flexible electrical and air connections between the body and the truck. The truck must be assembled before the body can be set on the swivel centerplates, and some form of restraint between truck and body must be added after the final assembly. For these reasons, the trucks naturally lend themselves to treatment as unit assemblies.

No matter what precautions are taken in all-welded structures, a certain amount of distortion occurs. Annealing and subsequent straightening can remove only a portion of the shape changes. Hence the parts were designed to eliminate the effect of shape changes.

First, the side frame and bolster parts are assembled in a fixture and tacked together. They are then removed and completely welded on a positioner, as shown in Fig. 2. The pedestal ways are set up in a special fixture, which assures proper spacing and centering with respect to the truck body, and are welded securely to the already welded truck frame. Thus the distortion caused by welding in the main frame is nullified



CAB 5—SIDE SHEETS for operator's cab are spot welded to frame members. Window openings are blanked out by die



6—OPERATOR'S CAB is lowered to position on main cab base. Engine cab is added later

7—FINISHED LOCOMOTIVE, a 65-ton Diesel, goes to work hauling raw materials for cement to the Southwestern Portland Cement Co., Dayton, O.

since the pedestal ways are not assembled until after that distortion has taken place. The exact alignment resulting from this method of assembly insures the proper functioning of the truck as a whole and results in a minimum of maintenance on wheel flanges, brake rigging, pedestal ways and other wearing parts.

PLATFORM

METHODS ADOPTED for fabrication of the platform well illustrate the advantages of the unit assembly method. The platform may be almost completely built and assembled upside down, as indicated in Fig. 3. It is fabricated while being clamped to a floor plate, thus permitting extensive use of automatic welding on the long seams. More exact location of centerplates and truck restraint mechanisms is allowed by this method. End frames and draft-gear housings are made up as subassemblies that are completely welded before they are incorporated in the platform proper. By these methods, the final product obtained is as flat and true as any welded structure can be.

When the platform is finally turned over and moved to its place in the locomotive assembly line, it has been fitted with a fuel tank, air reservoirs, corner steps, handrail fittings and even fittings for the uncoupling levers. The principal piping associated with the platform is also installed before the other parts are assembled to it.

POWER PLANT

ENGINE and main generator are coupled together and mounted on a sub-base large enough to hold all the auxiliaries that go with the power plant. The fan and fan drive, the radiator with its shrouds, the water connections to the engine are also parts of this assembly.

Before placing the power plant on the platform, the auxiliary drive pulley is mounted on the generator end; the exciter and air compressor are assembled; belts are tightened; all interconnections are made.

The fact that the power plant is a complete assembly enables the customer to carry a spare unit in stock. In case of failure, a new power plant can easily be installed.

MAIN CAB

SINCE MOST pieces of control equipment and air-brake apparatus are grouped in the main-cab area, this section has been further divided into three major parts: cab base, control cabinets and operator's cab.

CAB BASE

THIS PART occupies the space between the platform proper and the operator's floor and is normally about 2 ft high. It houses the battery, air-brake, distributing and feed valves, and the larger control items such as the reverser, shunts, etc.

The cab base is fabricated complete, including the operator's floor, and all items of air-brake apparatus are mounted and piped as far as possible. Fixtures are used to locate the structural members of the sides, ends and cab floor. An assembly fixture is also provided so that the complete base will fit the platform, and the operator's cab will fit the base. To facilitate the work of piping, the cab base is turned up on its side so that pipe fitters may work in a natural position.

The control cabinets, previously assembled and wired, are set up and bolted to the floor structure of the operator's cab. The engineer's brake valve is set up in position and piped; the engine-throttle control mechanism is installed. The completed cab base is moved to the final assembly line and set on the platform.

CONTROL CABINETS

CONTROL cabinets are fabricated complete, including supports for equipment, and are placed in a special line for the mounting and wiring of the smaller control items. Simple pin gauges are provided to locate the various equipment supports in the completed cabinet so that no trouble will be experienced in the final assembly. Channels for wires, with outlets properly spaced, are built into the cabinets; this greatly simplifies the wiring.

All of the control items requiring appreciable maintenance or adjustment are so grouped in these cabinets as to be easily accessible. Motor switches, air and oil pressure gauges are arranged on a panel which is an integral part of the cabinet. Each cabinet is wired and piped as far as possible before being placed in position on the cab base. Hence all of these operations may be performed with practically no interference.

The assembled control cabinets are set on the cab base (Fig. 4), and bolted into place. The entire unit is then set on the locomotive platform. Final step is to make connections to the larger control units, which were previously mounted on the platform in the space occupied by the cab base.

OPERATOR'S CAB

WHILE all of the above has been going on, the operator's cab has been fabricated complete in another part of the shop. The members comprising the frame of this structure are assembled in a locating fixture and arc welded together. The cab sheets are then spot welded to the frame. These sheets (Fig. 5) have window openings blanked out by a die.

The roof, including the lining and heat insulation, is similarly assembled and spot welded. In another fixture, the four sides are set up and are welded together. The roof is set on and arc welded to the sides.

Ball corner pieces are arc welded on the roof corners to complete the assembly. The design is such that all of the arc welding is done on the curved surfaces of the corners; con-

sequently, very little distortion is transmitted to the flat surfaces.

Window frames are spot welded into place, ready to receive glass. Cab lighting fixtures are installed, and the insulation of sides is completed. Supports are added for such items as hand brake staff, sander valves, fire extinguisher, etc. The unit is now ready to be set down on the cab base (Fig. 6).

So accurate are this method of construction and the fixtures provided that no hand fitting of the operator's cab to the cab base is necessary. An extra advantage is that complete interchangeability of cabs is assured. In cases where the operator's cab was irreparably damaged in a wreck, whole new cabs have been furnished and put on with a minimum of effort.

ENGINE CAB

THE ENGINE CAB, being the last major item to be applied to the locomotive assembly, presents some peculiar problems. In planning a unit assembly, the main difficulty is the necessity of making allowance for the accumulation of all the ordinary manufacturing tolerances plus the unavoidable distortion that creeps into welded structures. Unless this is done, the finished product won't have a reasonable chance of fitting in place in the final assembly.

We accomplished the above purpose by designing a more or less flexible connection to be welded to the operator's cab after the engine cab is fitted in place. Such construction allows for the unavoidable variations in platform flatness and cab height. Connection to the platform is accomplished with tapping strips, which are welded to the deck plate in the final assembly after the engine cab has been lined up.

This method may seem to smack more of selective assembly than of interchangeability. However, it is not expected that any attempt will be made to interchange engine cabs on different locomotives or even on the same locomotive. Obviously, a replacement engine cab could be furnished by also furnishing the connections to the operator's cab and platform.

All accessories to the engine cab are assembled while it is on the floor. These include the muffler, the exhaust pipes to the engine, the winter front with its control, the marker lights, the headlight, the number-plate boxes and lights, all necessary wiring. Sand boxes and access doors are also fitted so that only minor connections remain to be made when the engine cab is finally assembled on the platform.

FINAL ASSEMBLY

PLATFORM is set up on horses high enough to permit the necessary connections to be made under the deck without discomfort.

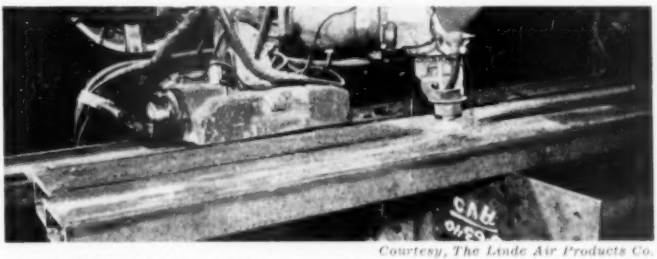
The larger control items such as the reverser, shunts, resistors, etc., having been previously assembled and wired on the bench, are set down on the deck plate in the space occupied by the cab base. The supports are then welded to the deck.

The power plants are lined up on the platform and securely anchored. Electric connections are then made from the generator to the control. At about the same time, the cab base is set in place and securely welded to the platform. Fuel lines, pressure lines, throttle connections to the engine and other minor hook-ups are completed. Air lines from the equipment previously mounted in the cab base are connected to the piping in the platform.

The operator's cab is set on the base as shown in Fig. 6 and bolted. Glass is installed in the windows; doors are fitted and hung; ties between the cab and the control cabinets are made; handrails are bolted in place. Miscellaneous items are installed such as the operator's seat, the hand brake chain and the engine shut-down pull rods. Electric connections from the cab lighting fixtures to the control switches are completed.

The engine cabs are then put on as previously described. Connections from the winter front control to the operator's station are made, and exhaust pipe lines are joined to the engine. Headlights and other electric equipment are hooked up.

Finally, the entire superstructure is moved onto the trucks. Here motor cables are joined and air brake hose connections made. The couplers are mounted and adjusted for height, and the locomotive is ready for testing and shipment.



Courtesy, The Linde Air Products Co.

SUBMERGED-MELT head joins two angles at corners to make a dipper stick

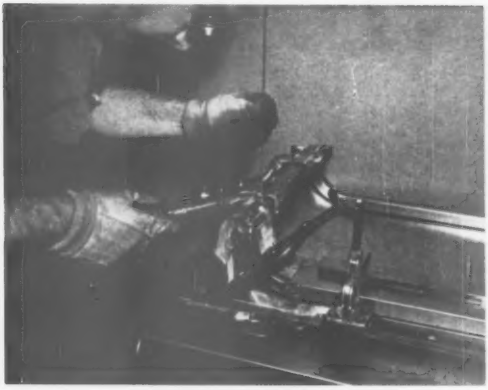
Quick Way to Make Box Beams

YOU CAN make box beams quickly and economically with submerged-melt welding. For example, the 16-ft-long dipper sticks shown in above picture were made by Dominion Bridge Co., Lachine, Que., Canada, by joining together 12 by 6 in. angles $\frac{5}{8}$ in. thick. Two angles make a box beam.

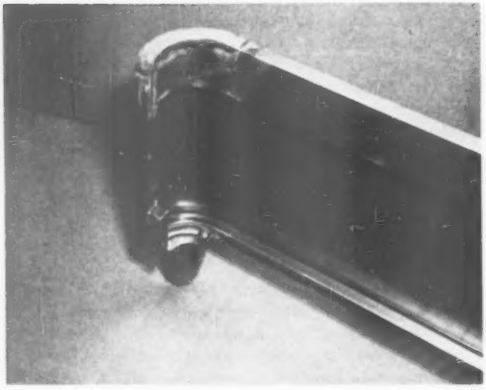
First, the long leg of each angle was beveled 30 deg to produce a vee for the butt-type corner weld. Next, the angles were tacked manually and brought to the submerged-melt machine. Welds were made at two diagonally opposite corners: three passes were needed for a seam. Each joint was backed by a $\frac{1}{2}$-in. rod.

You can also use channels to make box beams. Dominion Bridge does just that to get the bigger beams it needs for the axles of power shovels. A beam is made by welding together two 1-in.-thick channel members. Again, two welds are needed per beam, but the seams are on the sides instead of at the corners. Edges are beveled to provide a 22-deg vee for the butt weld. Five passes per seam are made with the submerged-melt head to fill the vee. The back-up bar is a strip $\frac{3}{8}$ in. thick by $1\frac{1}{2}$ in. wide.

Working with sheet steel. . . .

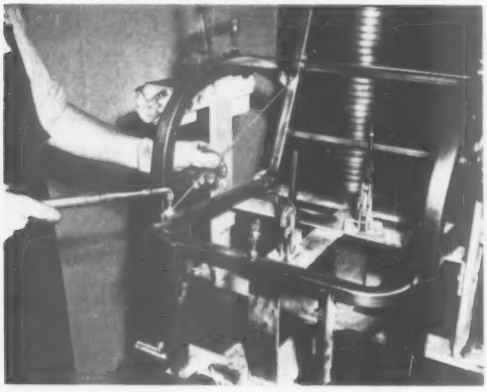


1—CORNER on metal bed represents good example of assemblies made by brazing formed sheet-steel pieces

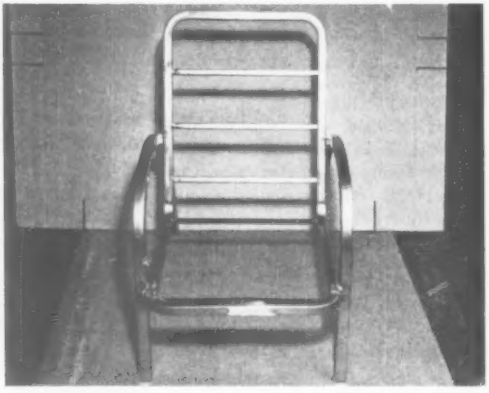


2—BRONZE IS generously applied over entire corner insert. There will be no low spots to be soldered

Working with tubing. . . .



3—LOUNGE CHAIR is a product made from tubing. Its several types of brazed joints carry the entire load



6—FINISHED chair frame. The only grinding needed was on the butt joint in the center of the main frame

Production Brazing*

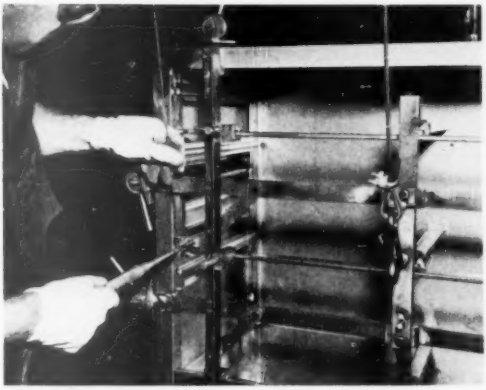
Where sheet metal or light-wall tubing is to be fabricated, look for savings to be found in gas welding with bronze rods. These savings may run 40 to 60% and can be repeated week after week

BY CLINTON E. SWIFT
Sales Engineer, The American Brass Co., Waterbury, Connecticut

WITH THE oxyacetylene torch and bronze welding rods, giant press frames, broken through heavy sections, are brazed together for a fraction of the cost of replacement. And they are back in service in a matter of hours, instead of weeks or months. These big repair jobs attract our attention because of their unusual size and the great savings effected. But brazing on production work may present opportunities for even greater savings—savings that can be repeated week after week.

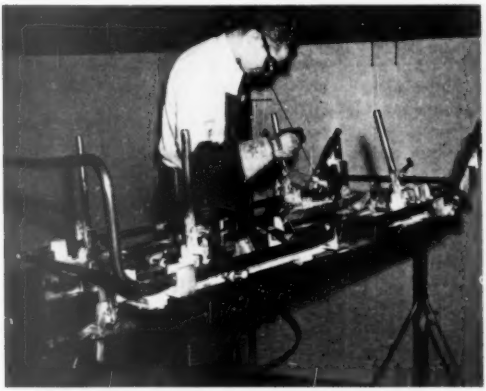
Let's look around and see where gas welding with bronze is being used every day on production jobs.

*Abstract of a paper presented at the 50th annual convention of the International Acetylene Association, San Francisco, March 29.

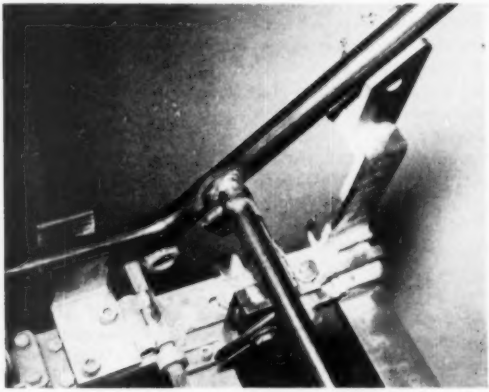


3—WELDOR applies low fuming bronze to cross rod held in place by a fixture. Product is a steel dresser

4—DRESSER has now been painted. Its smooth fillets and flat bronze beads required little or no finishing



7—OUTDOOR FURNITURE is fabricated in this fixture. It holds tubular parts in an accurate alignment



8—NOTE NEAT fillets around intersecting tubes and clip on the other side of main frame in this close-up

Making Metal Furniture

We are going to take a little trip to Kenosha, Wis., to look at some of the jobs done at The Simmons Co., a leading manufacturer of metal furniture. The writer wishes to thank Dan Raffone, welding engineer at Simmons, for his courtesy in supplying information and pictures.

Most of the production work done by gas welding with bronze at Simmons falls into one of two groups. First, we have formed sheet-metal parts, ranging in thickness from 0.020 to 0.062 in. Examples are steel dressers and cabinets of all kinds. The other main group consists of light-wall tube assemblies. Steel tubing is used for chairs and seating of all kinds, bed frames, hospital equipment and many other products.

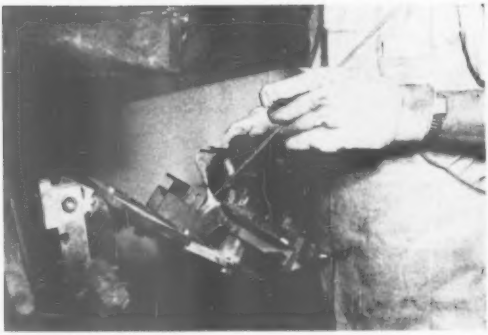
To appreciate the full economies of brazing, we must include in the cost of a joint the investment in welding equipment, work preparation and fit-up, welding time and clean-up time.

Gas welding (or brazing) requires only oxygen and acetylene regulators, hoses, a torch and tips. Cylinders do not need to be considered as equipment. Most production brazing is done with a flame-fluxing device; even if this is included, however, it won't add up to much more than $250 per operator.

Exact fit-up is not necessary; gaps can readily be filled between lapped sheets or between butted edges of sheets or tubing. Strength is adequate: the low fuming bronze generally used has a weld strength on steel of 55,000 to 65,000 psi. Weld deposits are sound—a vital consideration where joints are ground flush with the steel.

Usually the biggest saving made by brazing is in the finishing. Little or no finishing is required after the joint is made. Fillets are smooth; corner welds or butt joints sand down to smooth metal in a few sec-

9—NICKEL-SILVER brazing alloy gives strength to joint between intersecting steel rods. Joint is smooth



10—ANGLE rerolled from a railroad rail is brazed to a bronze casting. It is a tough combination to join

onds. Flame-fluxing leaves no heavy beads of borax glass to be chipped off. There is no flash nor weld spatter to worry about. And the low temperatures at which brazing is done minimize distortion.

Small assemblies are held in fixtures that can be rotated in one or two planes. The weldor can turn the work quickly to the best position for making each joint. On larger pieces, it is not difficult to braze on vertical or even on overhead surfaces. The light torch is easily moved from joint to joint in an assembly.

The bronze is applied with relatively large welding tips. These large tips make joints quickly with low total heat input. Distortion is greatly reduced; in many instances entirely eliminated. With flame-fluxing, the right amount of flux is on the work and the rod, just where and when it is needed.

Jobs in Sheet Steel

For our first group, sheet steel, typical brazing jobs are those shown in Figs. 1 through 4. The weldor in Fig. 1 is applying low fuming bronze with a torch to make a corner weld on a steel bed panel. Fig. 2 shows the many types of joints made in one assembly between metals of various thicknesses. The steel insert in the top corner was completely covered with bronze—it was faster to flood the bronze across the whole insert than to make two corner welds. The wide bronze deposit compensates for any irregularities in fit-up, and the joint cleans with one grinding operation. There will be no low spots to be rewelded or filled with solder.

The gas weldor in Fig. 3 is brazing runners, cross rods and side supports in a steel dresser. Simple lap and butt joints can be used when this method of welding is employed. Sections can be formed without thought of having to get inside them later with a spot-welding electrode. There is no worry about burning through; no flash nor spatter to interfere with the smooth operation of drawers in the completed dresser (Fig. 4.).

Jobs in Steel Tubing

Our second group consists of assemblies formed by steel tubing. Steel tubing is being used more and more for structural purposes. Fig. 5 shows one of the steps in the fabrication of a lounge chair. The fillets made with bronze are smoothly concave and require no finishing. The joints present a neat, streamlined appearance in their as-welded condition: only a few joints have to be ground. The many types of intersections in the chair are easily brazed. In Fig. 6 a butt joint (ground smooth) may be seen in the center of the frame. There are lap joints between full sections of the square tubing and intersections between large and small sizes of tubing. All joints are quickly made in one fixture or by turning the chair after it is out of the jig.

Fig. 7 is a good example of the type of fixture used to assemble tubular steel outdoor furniture. Quick-acting clamps hold all parts accurately in position. The whole fixture is mounted on trunnions so it can be rotated 360 deg. It can be turned over quickly when it's necessary to reach the underside of a joint. The close-up, Fig. 8, shows a brazed joint that can go right to the paint shop from the welding bench.

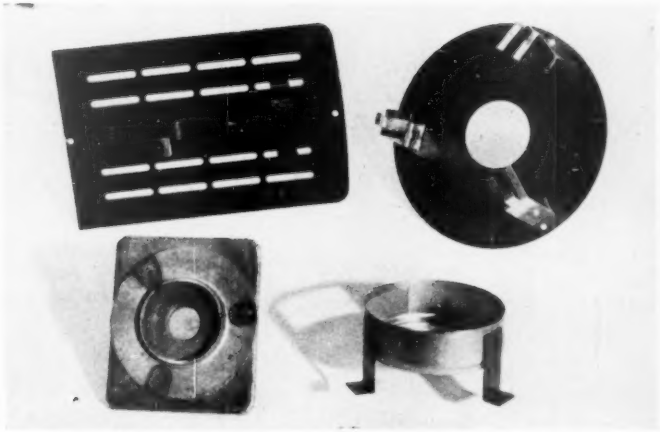
Solid steel rods are used in many places on hospital equipment. In cases where the highest possible strength is required, a nickel-silver brazing alloy is used. The weld-metal strength will run 60,000 to 70,000 psi: even higher strengths can be developed if the brazing alloy runs in between butted or lapped surfaces. The nickel-silver alloys are applied with the same torches and flame-fluxing devices used with the low fuming bronzes.

In Fig. 9, we see a part for a hospital bed being made from round rods. To develop the maximum strength, nickel-silver brazing alloy is used on this joint.

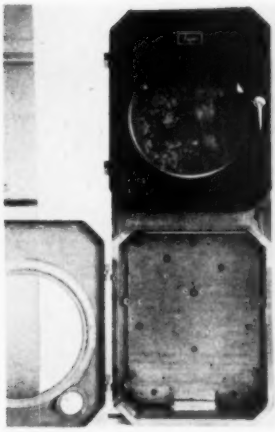
Dissimilar Metals Brazed

Brazing makes it possible to join dissimilar metals almost as easily as parts of low-carbon steel. In Fig. 10, an angle rerolled from a railroad rail is joined to a bronze casting to make a part for a hospital bedside cabinet. A smooth fillet is produced in the corner between the steel and the bronze. High-carbon steel and bronze are a difficult combination to join —except by this method.

The use of bronze with the oxyacetylene torch has *not* been pushed out of the production welding picture by arc and resistance welding. It still has a very definite place. Wherever sheet metal or light-wall tubing is being fabricated, look for savings in production by gas welding with bronze. The savings usually average 40 to 60%.



MOUNTING PLATES for Taylor instruments are now made by spot welding one or more stampings together. Locating jigs provide accurate alignment



INSTRUMENT CASES such as this are fabricated by spot welding

Precision Instruments · *Precision* Welded

Taylor Instrument uses resistance welding to cut costs, speed production, improve appearance of products. Postweld cleaning is usually unnecessary

BY LEE H. JUDGE

TAYLOR Instrument Companies, Rochester, N. Y., employs resistance welding in a variety of ways to cut costs, speed production and streamline the appearance of its products. The firm is a leading producer of precision instruments for domestic and industrial uses.

Taylor engineers report that spot welding creates a joint with excellent strength characteristics while leaving the surface free from projections or other irregularities common to many forms of joining. In addition to the net improvement in appearance, there is a minimum heat effect on the materials being joined.

Many of the parts used in Taylor Instrument assemblies are stamped from cold-rolled sheets, mechanical properties of which would be adversely affected by high temperature. When brazing or soft soldering is employed, it is usually necessary to provide cleaning operations for the removal of flux residues and perhaps oxidation. Such postweld cleaning is usually unnecessary when spot welding is employed. All of these factors combine to give spot welding, where it can be used, an appreciable advantage over soft soldering, brazing or riveting, according to Taylor officials.

Some of the firm's assembly parts —called mounting plates—consist of a number of steel stampings spot welded together to provide a strong, lightweight subassembly. Examples are shown in the left picture. The exposed surfaces are free from irregularities, creating a smooth finish.

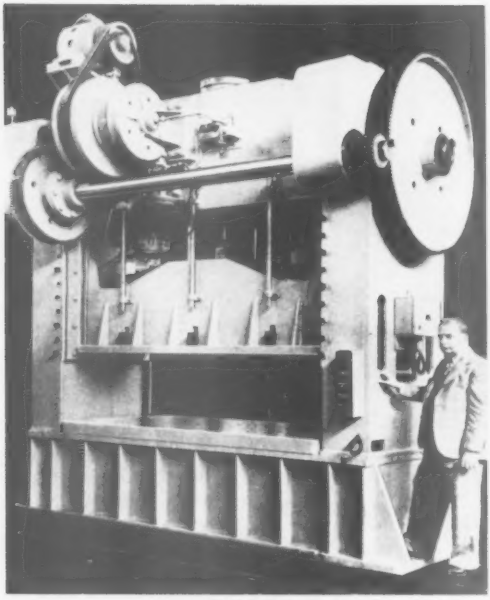
Another important assembly is the instrument housing, which is constructed from sheet-metal parts using simple jigging and spot welding. Similar construction where rivets are employed requires the alignment of rivet holes as well as the placing of the rivets. Production speed and improved appearance result from spot welding.

Spot welding at the Taylor plant is by no means restricted to steel parts. An example of a non-ferrous part is a strainer fabricated from perforated sheet brass by spot welding. The operation is speedy, simple and produces a quality part with fine appearance.

Another assembly is called a positioning joint. This could be fabricated from solid stock, but machining costs would be excessive as compared with the company's practice of spot welding together two stampings. The use of rivets for joining the stampings would have required more labor time, and the projection of rivet heads would have been quite objectionable.

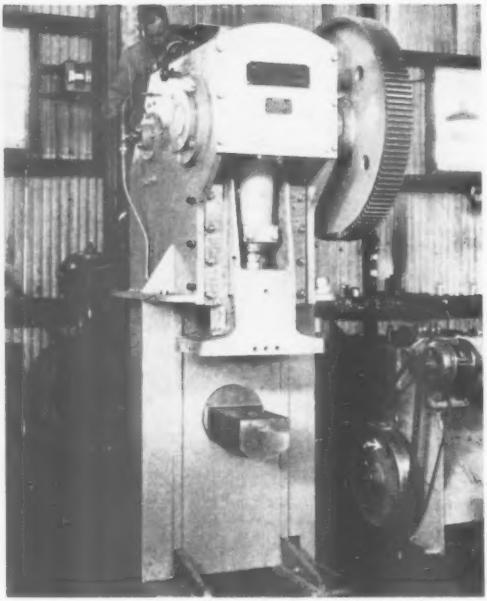
Even the very small assembly parts, such as the pen tips or pointer tips used on recording and controlling instruments, employ spot welding. These delicate assemblies are fabricated from stainless-steel strip ranging down to 0.005 in. thick. A typical item is a V-shaped pen attached to the pen arm by spot welding.

A more elaborate application of spot welding may be found in the fabrication of steel instrument cases. Mounting plates, brackets, latch plates, reinforcing strips, glass sealing rings and gasket containers are all spot welded to produce an attractive, structurally sound case.



Welded Products Pty., Ltd., Photo

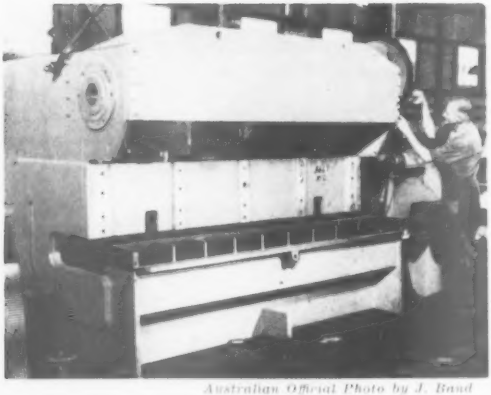
250-TON PRESS was built by a Sydney welding firm for blanking and forming the chassis of Australia's mass-produced car—the "Holden." Bed area is 9 by 5 ft. Frame of this big press is of welded construction



Australian Official Photo by J. Band

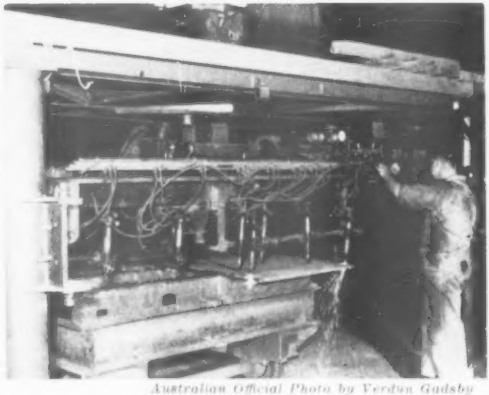
75-TON PRESS for fabricating water heaters is also welded. Australian welding techniques include manual and automatic carbon-arc processes, metal-arc welding, automatic and semiautomatic submerged-melt welding

BIG WELDING JOBS in Australia



Australian Official Photo by J. Band

GUILLOTINE SHEARS above, another all-welded product, are capable of cutting steel plate up to 10 ft by $\frac{1}{4}$ in. Welded machinery, say Australians, avoids the heavy pattern costs associated with cast designs



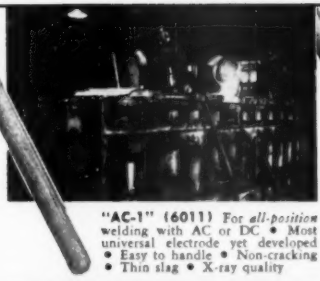
Australian Official Photo by Verdun Gadsby

MULTIPLE SHAPE-CUTTING (termed "oxy-profile cutting" in the land of the kangaroo) is done on above Australian-designed multitorch machine. Plate up to 10 ft wide can be handled and cut up to 6 in. thick

P&H gives you

6 Ways to Beat Your Mild Steel Welding Problems

"AP" (6010) For *all-position* welding with DC • Lots of penetration • High tensile and good ductility • Quick, easy slag removal • X-ray quality



"AC-1" (6011) For *all-position* welding with AC or DC • Most universal electrode yet developed • Easy to handle • Non-cracking • Thin slag • X-ray quality

"PF" (6012) For *poor fit*, single, or multiple pass welding • Solidifies rapidly • High deposition rate • Quiet action • Little spatter • All position • AC or DC

"AC-3" (6013) For use where *appearance* is important • Flat fillet • Easy slag removal • All position • Good physicals • AC or DC

"DH-2" (6020) For flat butt and horizontal fillet welds • America's fastest electrode • No spatter • Easy slag removal • X-ray quality • AC or DC

AC Arc Welders The only complete line of AC arc welders with exclusive, Dial-lectric, built-in remote control • Saves time, space, and motion • Cuts welding costs

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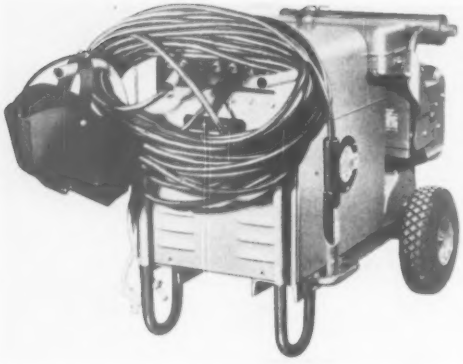
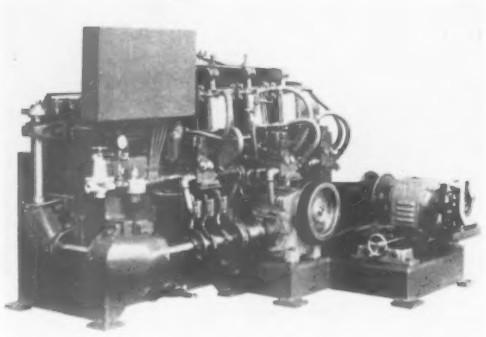
New products



WELDER and power-generator delivers 200 amp a-c welding current or operates electric stoves, deep freezers, electric milkers, etc.



AUTOMATIC flash welder produces washing machine wringer rolls at rate of 400 per minute. Pneumatic clamps hold roll components

Welder Power Plant Appeals to Farmers

NEW engine-driven 200-amp a-c welder is combined with a 3-kw power plant in either a stationary or portable rig. For welding, the output is sufficient to handle electrodes up to 3/16 in. in diameter. For power, the generator provides 110/220 volt, 60-cycle, single-phase current. One switch enables the operator to go from welding to generating current.

Pipe thawing is said to be much easier with the a-c current available from this machine. The manufacturer's warranty fully covers the high-duty-cycle operation needed for the thawing of iron pipe.

The generator is powered by a two-cylinder, 4-cycle air-cooled gasoline engine. The stationary model is designated Model AEA-200-L; the portable unit (on a rubber-tired truck) as Model AEA-200-L-P.

MILLER ELECTRIC MFG. CO., Appleton, Wis.

* * *

ALIGNING of piping or shafting for welding is helped by new rotary aligning tool.

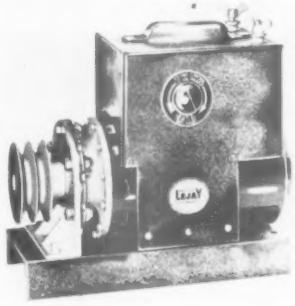
Rotary Work Aligner Aids Welding of Tubes

NEW ROTARY work aligner or positioner handles both centered or uncentered cylindrical work of diameters from ¼ to 24 in. Two or more aligners can be used together to handle shafts or tubes of almost any length.

Expected uses for the tool are in welding, assembly, maintenance or repair jobs. At present, four models are being produced with bed lengths ranging from 5 ft. 10 in. to 11 ft. 6 in. Load capacity is 1,500 lb.

JOHNSON MACHINE WORKS, Eau Claire, Wis.

* * *



FARM WELDORS can use this 200-amp model made from an aircraft-type generator

Portable Generator Provides 200 Amp

A REMODELED aircraft generator is the basis of a new portable 200-amp arc welder suitable for either electric motor or engine drive. It is recommended for farmers and other users who have intermittent welding jobs. Amount of welding current is controlled by a dial on the side of the case.

LEJAY MFG. CO., 2908 South Emerson Ave., Minneapolis 8, Minn.

Dual Flash Welder Used on Wringer Rolls

A NEW 75-kva Federal flash welder is capable of turning out finished parts at the rate of 400-450 per hour. Its cycle is completely automatic except for the loading and unloading of parts.

The new dual welder was built for the high-speed fabrication of wringer roll assemblies for clothes washers. It has a standard "Cone-Drive" double-enveloping speed reducer geared 40 to 1 that takes care of the maximum upset force of 4,500 lb at each end.

The workpieces are pneumatically clamped with trunnion-mounted double-acting air cylinders, and both welds are regulated with eight-point heat control. Platen guides insure accurate alignment of welded parts.

In operation, the tube for the wringer roll is placed on the lower dies at the center of the machine. The cold-headed trunnions to be welded to the ends of the roll are inserted into fixtures mounted on sliding platens. When the start button is pressed, the upper dies drop to clamp the parts. The sliding platens are forced inward by cams when the weld is completed, the part is released and the platens are withdrawn by air pressure.

THE FEDERAL MACHINE AND WELDER CO., Warren O.

* * *

No Chipping Between Passes, Claims Electrode Maker

THE new "Steel-Teelic" electrode is claimed to have a "self-cleaning" flux that enables multiple-pass welding to be done without need for slag chipping between passes. Neither does any cleaning have to be done after single-pass welds, states manufacturer.

Welding may be done at either high or

for welding

Spring welding products lead off with a combination farm welder and small power plant, a high-speed flash welder and tools for attaching cable lugs. Clamps and positioners are also new

low amperages. On thin sheets, current may be reduced to 50 amp with 5/32 in. electrodes. On heavier material, larger-diameter electrodes and higher currents may be utilized for faster, more efficient welding. The new electrode is available in diameters of ⅝, ¼, 3/16, 1/32, ⅛ and 3/32 in.

EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York City 13.

* * *

WELDED toggle clamps have 700 and 1,000 lb forces. Bronze plunger resists weld spatter

Two Toggle Clamps for Heavy Duty

Two new heavy-duty clamps develop forces of 700 and 1,000 lb. Both are of all-welded construction. The 700-lb clamp (top in picture), Model D-2, has a bronze plunger to prevent weld spatter from adhering to it. Stroke is 1¾ in.

The 1,000-lb clamp (bottom in picture), Model C-2, is a horizontal toggle clamp. It is recommended for very heavy operations such as milling and drilling. An even greater force than 1,000 lb is obtainable by shortening the work bar.

GENERAL WELDING CORP., 7404 Euclid Ave., Cleveland 3.

* * *

Handle Reverses on Light-Duty Polisher

DESIGNED for intermittent service in small shops and garages, a new 7-in., 8-lb "Junior Polisher" is fitted with a convenient auxiliary side handle. Handle is reversible for either right or left hand use. The polisher is equipped with a spindle locking pin for fast changing of bonnets and pads. A trigger switch with switch locking pin on the side handle allows for continuous operation. No-load speed is 2,000 rpm. Tool is operated by an a-c/d-c motor using 115 or 220 volts.

THE VAN DORN ELECTRIC TOOL CO., Towson 4, Md.

* * *

CRIMPING lugs onto welding cable is easy with Tweco punch set. Block is held in vise and barrel impacted with hammer blows

Tweco Crimping Tool Attaches Cable Lugs

NEW block-and-punch set for crimping Tweco copper lugs to welding cables consists of two simple tools (top picture). A block of cadmium-plated case-hardened steel goes with a tempered tool-steel punch of special design. Saddles of the block fit the three sizes of Tweco copper lugs.

To use, place the block in vise jaws as shown in the bottom picture. Put an empty cable lug in the proper saddle. The bottom contact surface of the tang must be turned up. Square off the barred strands of the cable and insert end into lug barrel. The rubber cable cover should extend clear up to the barrel.

Place punch along longitudinal center of the barrel and strike it a light blow with a hammer. This should cause a small crease. Repeated heavy hammer blows on the punch will impact the barrel into the cable strands. To tighten corners on the strands, hammer with 45-deg blows at the bottom of the "U" formed by the barrel.

The impacted copper-to-copper contact is claimed to assure maximum conductivity. Elimination of heat source, soldering materials, no burnt strands, no stiff joints and no corrosion from acid residue are other advantages claimed for this method of making cable connections.

TWECO PRODUCTS CO., English at Ida, Wichita 1, Kans.

* * *

K-G MODEL K-50 torch takes tip sizes 75 to 30. Cutting capacity is 6-in. steel

Two K-G Torches for Welding and Cutting

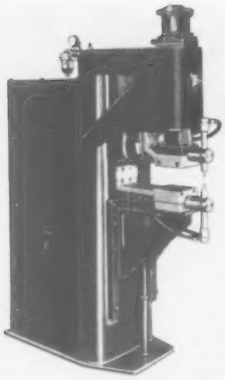
Two new welding and cutting torches are equipped with tips enabling them to weld or cut almost any thickness of metal. Smaller of the two, Model E50, has a welding range up to approximately ½ in. steel, with a size 40 tip. Its cutting range extends up to 3 in. thick, with cutting tip size 45.

The larger torch, Model K50, will weld the heaviest plates and cut steel up to 6 in. thick. Tip size 20 is used for welding and tip size 40 for cutting.

Mixer of the E50 Torch is used with nine sizes of two different styles of tips. Hose connections have replaceable bushings for low-cost repair. Cutting attachment for E50 torch embodies an "O" ring of Neoprene to prevent gas leakage. All joints in torch and attachment are silver soldered except bushings and cone connector.

The K50 torch has a solid Monel head in conjunction with brass seats in the mixer. Swiveled conical needle valve bodies reduce repair costs. The helical mixer accommodates all swaged tips from drill sizes 75 to 30 inclusive. All joints are silver soldered as in the smaller torch.

K-G WELDING & CUTTING CO., INC., 515 W. 29th St., New York City. 1.



EITHER spot or projection welding may be performed with 50-150 kva Banner welders

Press-Type Welders for Spot-Projection Welding

NEW Banner line includes press-type projection and spot welders rated at 50 to 150 kva. Roller heads are air-operated and designed for fast performance. Airline equipment is mounted on top of the unit for easy accessibility. Each machine will do either spot or projection welding. An 8-stage heat-selector switch assures proper current for a wide range of metals. For spot welding, 2¾-in. arms and 1¼-in. ejector-type holders are provided.

BANNER MFG. CO., 1934 North 29th St., Milwaukee.

* * *

HOT TRIMMING of weld upset on welded railroad rails done by hard-faced blades

Hot Trimming Device Speeds Welding of Rails

AMONG new refinements of the oxyacetylene pressure-welding process is a hydraulic trimming device for shaving off the upset on a welded railroad rail. The trimming is done at 2,000 F with blades hard-faced with a cobalt-chrome-tungsten alloy. If the trimming is done immediately after welding, no reheating is required. The hard-faced blades are said to make over 1,000 cuts without sharpening or replacement.

Formerly, the upset at the weld was trimmed off with a hand-held oxyacetylene torch. It was difficult to trim close to the rail surface. The new trimmer planes the top and sides of the rail to a close tolerance, reducing grinding to about one-third that formerly required.

THE OXWELD RAILROAD SERVICE CO., 23 North Michigan Ave., Chicago 1.

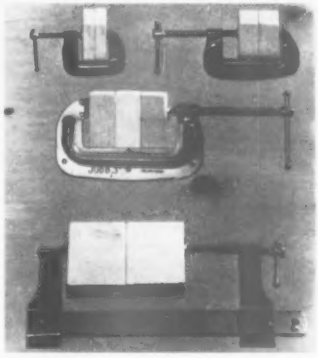
Plastic Cover Lenses Offered by American Optical

Cover plates of clear plastic to protect the more costly welding lenses are announced by American Optical. These are made from methyl methacrylate, the material used for bombers' nose sections; they meet optical requirements of the Bureau of Standards and are claimed to outlast glass cover plates.

Two sizes are available: standard, 2 by 4¼ in. and a slightly smaller size, 2 by 4⅛ in., on special order. Both are 0.060 in. thick.

AMERICAN OPTICAL CO., Southbridge, Mass.

* * *



SMALL clamps are made of wrought steel for strength. Bottom clamp has movable jaw

Small Spot-Welded Clamps Offer High Strength

SMALL C-clamps of 1, 2 and 3-in. sizes are made of wrought steel for extra strength. Body of the clamp consists of two pieces of steel with longitudinal ridges pressed into them; the latter are spot welded back to back. Bar and screw are made of polished steel.

A 6-in. sliding jaw clamp affords instant adjustment effected by moving one of the jaws along a steel bar and securing it when the workpiece is contacted.

H. L. JUDD CO., Wallingford, Conn.

NEW DISPLAY BOARD helps sell electrode holder, cable connectors, lugs, adaptors, etc. It is offered to welding equipment distributors by Wagner Mfg. Co., Jackson, Mo.

SMALL induction heater for preheating and stress relieving piping is 29 in. high

Preheating of Piping Done by Induction Heating

NEW combination for preheating and stress relieving of welded piping consists of the Model RTA regulating unit and Model AC3 low-frequency induction heating unit. Both are rated at 40 kva.

Designed for limited space where ordinary preheating procedures would be difficult, the heater and regulator operate on 220-440 and 550 volts at commercial frequencies. With this combination, more equipment can be added as required for larger jobs. The Model AC3 can be used as a booster with other Smith-Dolan system heating equipment.

ELECTRIC ARC, INC., 152-162 Jelliff Ave., Newark 8, N. J.

Correction

The correct street address for the manufacturer of the tinning paint announced in the March issue of THE WELDING ENGINEER (Page 46), is Swiss Laboratory, 1533 Hamilton Ave., Cleveland 14.

New Welding Cables Shielded by Neoprene

WELDING cables with jackets containing 60% Neoprene by weight are said to have good aging characteristics, great resistance to oil, ultra-violet rays, wear, heat and cold.

Artificial-aging tests indicate, say company officials, that these new cables will have greater tensile strength after ten years' service than ordinary cables when new. The Neoprene is also claimed to have a greater flexibility.

Cable size, type, voltage-carrying capacity, number of conductors and Pennsylvania and Bureau of Mines approval number are vulcanized into the jacket.

WESTERN INSULATED WIRE CO., 1001 East 62nd St., Los Angeles 1.

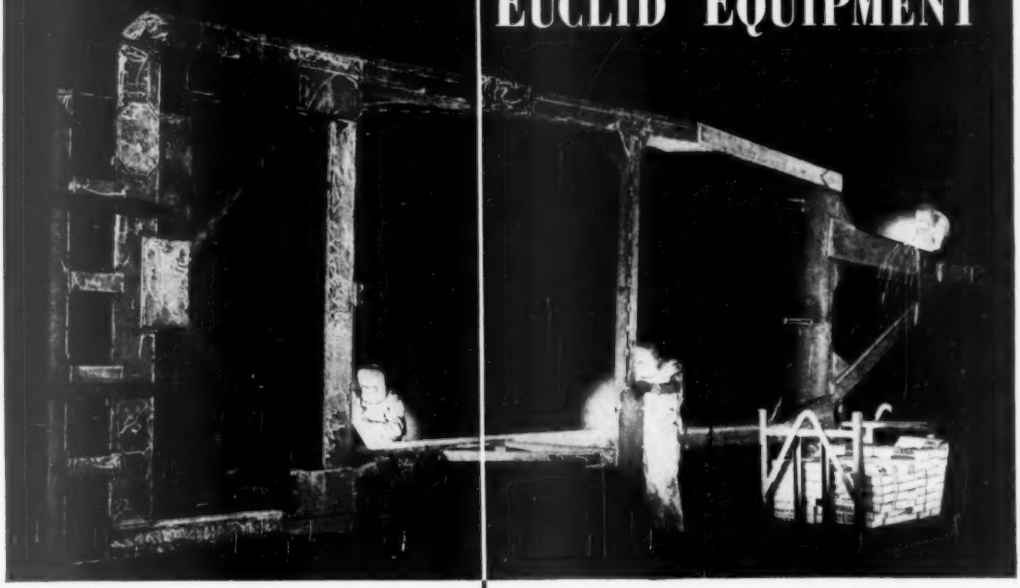
* * *

Handy & Harman Markets Brazing Alloys Package

A TRIAL package of "Easy-Flo-45" contains 5 oz. of 1/16-in. silver-brazing wire and instructions for doing brazing jobs.

HANDY & HARMAN, 82 Fulton St., New York City 7.

MUREX *Speeds Welding of* EUCLID EQUIPMENT



MUREX

Fast, easy-to-use, Murex Genex electrodes speed production of welded frames for heavy duty earth moving equipment built by The Euclid Road Machinery Co. And, their nearly spatter-free operation reduces weld cleaning time to a minimum.

Many of America's leading fabricators have standardized on Murex electrodes because of their ability to provide high quality welds at low cost. Let us put you in touch with Murex performance today. Descriptive literature—yours for the asking.

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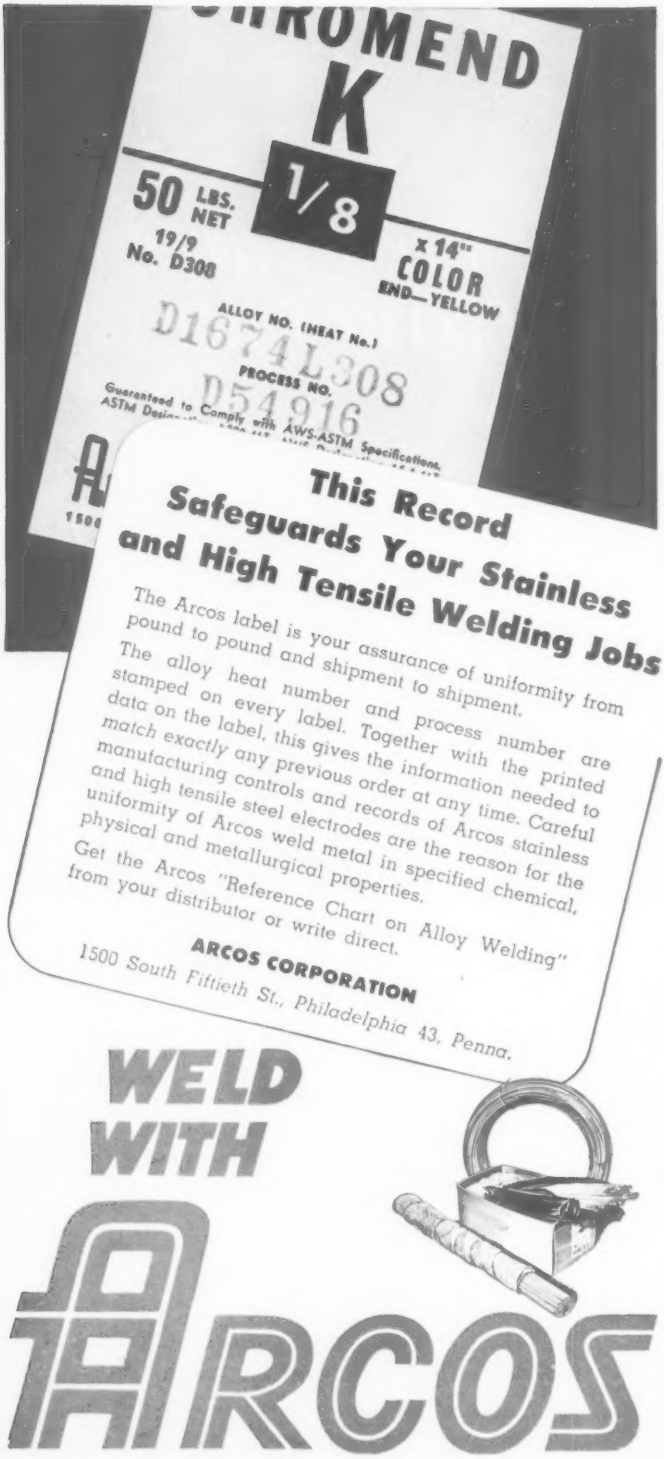
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50 LBS. NET
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Guaranteed to Comply with AWS-ASTM Specifications
This Record
Safeguards Your Stainless
and High Tensile Welding Jobs
The Arcos label is your assurance of uniformity from pound to pound and shipment to shipment.
The alloy heat number and process number are stamped on every label. Together with the printed data on the label, this gives the information needed to match exactly any previous order at any time. Careful manufacturing controls and records of Arcos stainless and high tensile steel electrodes are the reason for the uniformity of Arcos weld metal in specified chemical, physical and metallurgical properties.
Get the Arcos "Reference Chart on Alloy Welding" from your distributor or write direct.
ARCOS CORPORATION
1500 South Fiftieth St., Philadelphia 43, Penna.
WELD WITH
ARCOS

Economy, Ease Claimed for Silver Brazing Washers

NEW method of coining silver alloy washers for various brazing, soldering, bonding and soldering operations is claimed to save the user 30 to 52% in cost. Round silver wire rings are subjected to 180,000 psi pressure between polished dies which form them into flat rings. The flat ring design is claimed to produce a more perfect bond than wire rings and in addition is easier to store and protect against damage.

New design washers have been useful in joining fittings for drain plugs on crank case pans, differential housings and fluid drive seals. The washers are available in both "Easy-Flo" and "Sil-Fos" silver alloys, products of Handy & Harman, New York City.

LUCAS-MILHAUPT ENGINEERING CO., 5057 South Lake Drive, Cudahy, Wis.

* * *

Tool Marks Contours On Big Piping

THE new "Jumbo Contour Marker" aids layout work on piping and structural steel in diameters from 16 to 48 in. Former models of the marker handled diameters from 1½ to 18 in. An adaptor for square or rectangular shapes comes with each marker. A belt for fastening the marker to the pipe is also included. The entire set of equipment is packed in a wooden box.

CONTOUR MARKER CORPORATION OF CALIFORNIA, 1843 East Compton Blvd., Compton 2, Calif.

NEW PRODUCT BRIEFS

Enclosed instrument panels for industrial thermometers and heat control devices are wired and ready for connecting power and thermocouple leads. Suitable for bench or wall mounting. CLAUD S. GORDON CO., 3000 South Wallace St., Chicago 16.

* * *

Special drill for body shops weighs 1¼ lb and cuts through ¼ in. metal and ½ in. wood. A side-grip handle adjustably rotates in a slot on the tool for comfortable two-handed operation. No-load speed is 1,300 rpm. CUMMINS PORTABLE TOOLS, division of Cummins Business Machines Corp., 4740 Ravenswood Ave., Chicago 40.

* * *

Non-reproducible ruling on new engineering cross-section paper allows only the drawing to be reproduced on the blueprint, black-and-white or "Ozalid" print. THE OGILVIE PRESS, 691 Fulton St., Brooklyn 17.

* * *

Emergency fire blanket requires only a thrust of an arm through a loop and twist of the body to wrap it around flaming clothing and thus smother it. Useful in laboratories, oil refineries, spray rooms, etc. INDUSTRIAL PRODUCTS CO., 2802 North Fourth St., Philadelphia 33.

ATLAS "HEAVY DUTY" TOMAHAWKS

TOUGH AS THEY COME—
THESE MAN-SIZE TOOLS!

MODEL-K (chisel & Cross Chisel Head)

MODEL-L (Cone & Chisel Head)
MODEL-LCP (Cone & Cross Chisel Head)

A head style to suit your needs in metal or wood handle.

MODEL-M (Chisel & Cross Chisel Head)

MODEL-N (Cone & Chisel Head)
MODEL-NCP (Cone & Cross Chisel Head)

LARGER, TOUGHER FOR HEAVY WORK

● The Atlas Tomahawks shown above are husky, man-size one pound tools for heavy work and embody all the features of standard weights —just larger in all dimensions.

These Tomahawks are standard in many shops where for the slight additional cost they prefer their longer life and ability to stand up in rough-tough usage.

Their hand forged, solar steel heads are silver brazed to the handles for safety. Next time you buy try one of these heavier models.

★ *See your local welding supply dealer.*

Atlas WELDING ACCESSORIES COMPANY

707 E. LEWISTON AVENUE FERNDALE 20, (DETROIT) MICHIGAN

GRINDING WELD from cold-rolled steel lighting fixture rings, using wall mounted backstands with Grit 80 Three-M-ite Cloth Belts.

100% FASTER WELD GRINDING WITH 3M BELTS

Backstand method produces smoother finishes at 43% saving

Smoot-Holman Company at Inglewood, California found that converting from coated set-up wheels to Three-M-ite Abrasive Belts meant a real saving in time and production costs. Their production rate jumped from 37 to 75 pieces per man hour, and grinding costs dropped from 3½ ¢ per unit down to 2¢ per unit.

Couple these savings with smoother finishes and equipment that's easier to operate, and you'll see why the backstand grinding method is rapidly gaining widespread acceptance.

Use handy coupon for your copy of the new STEP UP PRODUCTION book.

MINNESOTA MINING & MFG. CO.,
St. Paul 6, Minn.

Please send me a copy of your "Step Up Production" booklet.

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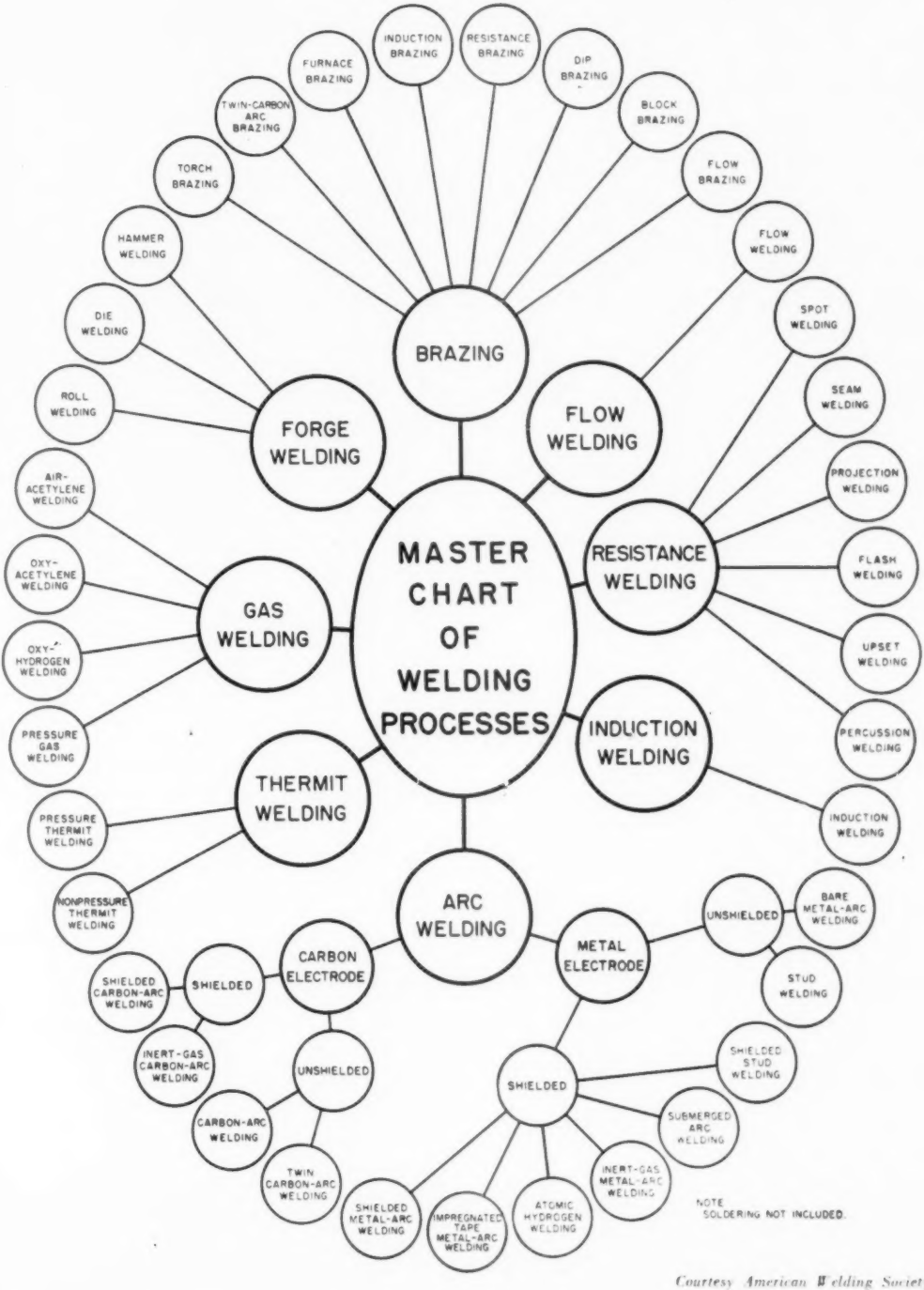
FREE BOOKLET shows you actual case histories of how 3M Abrasives have saved thousands of dollars in finishing costs. Volume II is just off the press—33 pages crammed with money-saving ideas. Write for your copy today.

Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives.

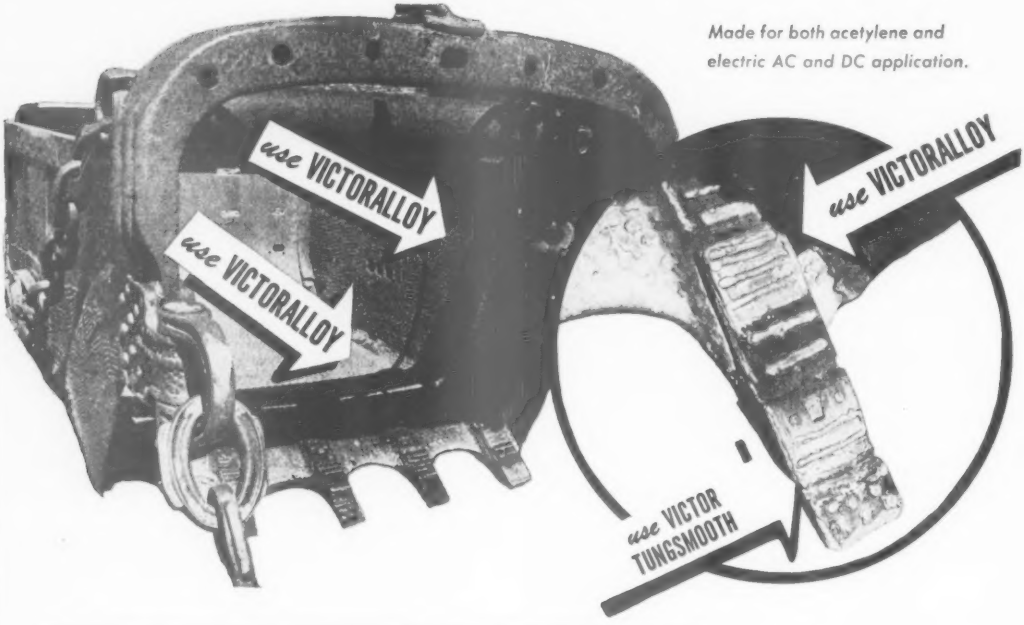
General Export: Durex Abrasives Corp., *New Rochelle, N.Y.*
In Canada: Canadian Durex Abrasives Ltd., *Brantford, Ontario*



Courtesy American Welding Society

FASTER and SMOOTHER with VICTOR HARD-FACING ALLOYS

Made for both acetylene and electric AC and DC application.



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VICTORALLOY	Abrasion and severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers
VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides
VICTOR HS 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, wire guides, rocker arms
VICTOR HS 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies; cams, hot punches, pump shafts
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick augers, pug-mill knives, screw conveyors

VICTOR

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Victor Super-Titan Blasting Nozzles

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1 ABRASIVE BELTS — Minnesota Mining and Mfg. Co., St. Paul 6, Minn. 32-page, two-color booklet tells in pictures how abrasive belts remove welds on stainless-steel dryers, bicycle frames, etc. Belt-grinding operations on castings, forgings, tubing, and other materials are illustrated. The booklet gives a clear explanation of grinding and polishing lathes, backstand idlers, contact wheels and how the abrasive belts are made.

2 D-C RECTIFIER WELDER—Westinghouse Electric Corp., Pittsburgh 30. Booklet DB 26-100 gives engineering information on new d-c rectifier welders of 200, 300 and 400 amp capacities. It covers relative power costs, performance, electrical and welding characteristics, dimensions and weights. Graphs of kva input, efficiency and power factor.

3 PIPE NOTCHING—Vogel Tool and Die Corp., Chicago 47. 4-page two-color bulletin shows the "Arc-Fit" tube and pipe-notching production tool for cutting tube up to 2 in. OD. It shows types of notches, explains operating features and joint combinations.

4 HARD-FACING ELECTRODE—Stula-Sickles Co., Newark 5, N. J. 6-page pocket-size folder describes the new "Seaco" a-c/d-c hard-facing electrode and gives welding procedures for hammers, crushers, shovel teeth, fly ash fan blades, pump shells, etc.

5 HARD-FACING PRICES—American Manganese Steel Division, Chicago Heights, Ill. 10-page price schedule W-1 lists quantity prices for manganese, hard-facing alloys, tungsten carbide particles and inserts, tooth repointers, wedge bars, applicator bars, and special alloy shapes.

6 RAILROAD WELDING — Ampco Metal, Inc., Milwaukee 15. 2-page reprint of an article in THE WELDING ENGINEER tells the advantages of welded overlays on locomotive roller-bearing shoes. Article first appeared in THE WELDING ENGINEER for July, 1949, under the title, "New Shoes Not Needed."

7 ELECTRODE COILS—The Reid-Avery Co., Inc., Baltimore 22, Md. 4-page bulletin describes lightly coated open-arc automatic welding electrodes in coil form. It lists five regular stock grades as to chemical composition, wire diameter, weight of coil and type of coil.

8 HARD FACING ALLOYS—Rankin Mfg. Co., Los Angeles 6. 8-page two-color Catalog B-1 and price sheet lists and gives specifications for gas and arc welding rods and electrodes. More than 200 industrial applications are listed with the specific "Ranite" hard-facing alloy recommended for each. Two pages of welding hints are included.

HOW TO ORDER: Fill out one of the small card sections completely (name, address, your company, etc.) for each piece of literature you would like to have. Each card section must be completely filled out; do not use ditto marks. Each circle must contain the number that appears with the item on which you desire further information.

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9 ENGINE-DRIVEN WELDERS—Hobart Brothers Co., Troy, O. 4-page, two-color folder illustrates the controls, exciters, engines, mountings, ventilation features, etc., of Hobart engine-driven arc welders. It tabulates specifications for ten models of welders and welder-generator combinations.

10 WELDING PUMICE—L. B. White Co., La Crosse, Wis. Single-sheet two-color bulletin on dry powder pumice for gas welding has seven illustrations of its protective, clamping, backing, aligning and insulating features.

11 WELDER REPAIR—Lincoln Electric Co., Cleveland 1. 6-page folder lists 146 Lincoln authorized field service shops in 44 states for repairing arc welders. It explains exchange plan and tabulates allowances on old parts.

12 WELDORS CLOTHING — Aljay Mfg. Co., Inc., Philadelphia 30. Catalog sheets describe leather aprons, gloves, leggings, trousers, etc. to protect welders' clothing.

13 AUTOMATIC WELDING — The Auto Arc-Weld Mfg. Co., Cleveland 4. 4-page, two-color bulletin explains and describes the "Auto Arc" welding head controls for open-arc, shielded-arc or submerged-arc welding with a-c or d-c. Pictures show operating features and construction details.

14 FLASH WELDERS — Precision Welder and Machine Co., Cincinnati 10. 4-page, two-color bulletin describes resistance flash-butt welders in 20 to 250 kva sizes. It pictures five models and points out pertinent operating controls and assemblies.

15 WELDING CLAMP—Naper Clamp Co., Naperville, Ill. 4-page Bulletin No. 102 describes the Naper clamp for heavy welding, machining, drilling and milling operations. Line diagrams explain operation of the clamp.

16 SAFETY DEVICES—General Scientific Equipment Co., Philadelphia 32. 46-page catalog illustrates and describes safety devices for welding, foundry, mine, utility and farm.

17 PORTABLE SHEAR — Stanley Electric Tools, division of The Stanley Works, New Britain, Conn. Single-sheet bulletin pictures and lists features and specifications for the Stanley No. 214A "Unishear" portable shear. Material capacities, maintenance data and operating instructions are included.

18 FARM WELDER—Calf-Teria Sales, Inc., Fort Wayne 3, Ind. Single sheet, two-color bulletin describes 65-amp, 110-volt welder for farm use. It lists dimensions of welder, power source, weights, and applications.

19 ELECTRODE HOLDERS—Wagner Mfg. Co., Jackson, Mo. 8-page pocket-size folder describes and pictures six electrode holders, two ground clamps, terminal and cable lugs and a special swedging tool.

20 R-W CONTROL — Westinghouse Electric Corp., Pittsburgh 30. Booklet B-4309 describes synchronous and non-synchronous resistance-welding controls. It also explains auxiliary control panel set-ups for specific jobs.

21 METAL POWDERS—The National Radiator Co., Johnstown, Pa. 4-page Bulletin No. 567 illustrates and describes iron, steel, nickel, manganese and silicon powders produced by the company. Electrode coatings, cemented carbides, fuses and fireworks are some applications listed for the powders.

22 LONG-SPAN JOISTS — Dominion Bridge Co., Ltd., Lachine, Que. 12-page two-color catalog S-100 shows design features of Dominion long-span joists including various loadings, variable pitch, spread chords and open webs. Two pages of load tables and specifications are included.

23 WELDING POSITIONERS—Harnischfeger Corp., Milwaukee 14. 12-page, two-color Bulletin P-1 shows "dual-capacity" and other features of P&H welding positioners. Attachments, controls and safety devices for the positioners are listed and explained.

24 RESISTANCE WELDERS—Precision Welder and Machine Co., Cincinnati 10. 4-page bulletin shows spot, multiple spot, flash, bench, portable gun, seam welders. Pertinent operating features, power requirements and capacities are listed.

25 HARD FACING ALLOYS—Alloy Rod and Metal Division, Victor Equipment Co., Los Angeles 2. 4-page bulletin 309 describes "Victorite," Victor HS-1 and Victor HS-6 hard-facing alloys. Properties are discussed and two pages of applications, alloy and procedure recommended are listed.

26 TINNING PAINT—Swiss Laboratory, Cleveland 14. 6-page pocket-size folder explains the tinning action of a new paint developed for soldering and welding. Diagrams show procedures for using the paint and applications in the dairy, factory, power-station, repair shop, etc.

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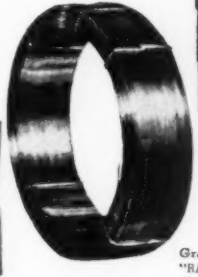
A superior PRODUCT AT A competitive PRICE!

Wire in special layer-wound coils for submerged arc welding



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"RACO" Mild Steel
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Furnished in all standard size catchweight coils and layer wound coils.

YOU profit by these RACO extras: Rigidly inspected high quality steel. Beautiful bright copper coating. Uniform layer winding. All layer-wound coils are of uniform weight. Controlled curvature to insure proper feed-off.

Wire is drawn, copper coated and layer-wound in one continuous operation on special machines developed by us.

Coils are protectively and handily packed in heavy corrugated cartons to eliminate removing yards of wrapping paper on individual coils. Orders of one or more tons are packed twenty-eight cartons to a steel strapped pallet. Our special packing methods save you time, labor and storage space. Our superior quality assures superior welds.

The REID-AVERY COMPANY
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It is the sales policy of The Reid-Avery Company, Inc., to market our products exclusively through distributors and agents.

Members of THE AMERICAN WELDING SOCIETY *and* THE NATIONAL WELDING SUPPLY ASSOCIATION

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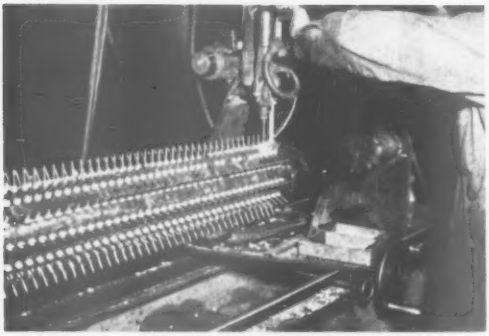
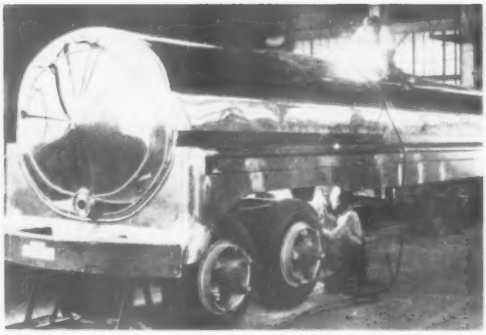


Courtesy Nelson Stud Welding Div., Morton Gregory Corp.

PINS ARE END WELDED to rolls at the rate of seven per minute with the aid of above special fixture. Each roll takes over 800 pins



Courtesy The International Nickel Co., Inc.

ASSEMBLING a stainless-steel milk tank by welding at the Heil Co. Tank carries 2½ in. of insulation between its inner and outer jackets

Stud-Welded Hair Comber

JAY SMITH, San Francisco consulting mechanical engineer, has designed a new hair combing and drying machine for tanneries. Thirty-six pin-studded rolls do the combing; drying is accomplished by hot air. The hair emerges from the machine, dried, combed and ready for baling; it will be used in rug pads, insulation, gun wads and similar products.

Stud welding provides an economical method of installing the 30,000 pins needed on the 36 rolls of each machine. Bob Hipp Welding Co., Menlo Park, Calif., does the welding on a special machine. The blank rolls, measuring 4 ft long by 5¼ in. in diameter, are chucked for rotation under a hand-operated stud-welding gun. Proper positioning is secured by means of an indexing mechanism.

As soon as a pin has been welded to the roll, the operator turns a crank (at front of machine) to advance the welding gun to the next position. He inserts a pin and protective ferrule in the gun and moves a hand lever to lower it against the roll. Final step is to press the trigger; pin is welded to the roll in a fraction of a second. Production rate is seven welds a minute, and tolerances of 0.005 in. are obtained.

Previous method of drying the hair was to use a conventional screen belt. Results were often unsatisfactory because the hair would mat and dry unevenly. Mr. Smith's machine carries the hair through the dryer in a continuous thin layer. Material once discarded as waste can now be economically processed.

* * *

Air Gun Aids Arc Cuts

LEO J. ANCTIL, a weldor at the Portsmouth Naval Shipyard, Portsmouth, N. H., thought that there must be a faster way of cutting out faulty welds in stainless steel for rewelding. He conceived the idea of combining an air pistol with an electrode holder to speed up arc cutting with a jet of compressed air.

AIR PISTOL and electrode holder combine arc and air to cut out faulty welds in stainless. Device speeds cutting, leaves no carbon

In Anctil's gimmick, the trigger (valve mechanism) of the pistol is clamped on the electrode holder, to be pressed or released by the operator's thumb. A short flexible hose leads from the valve to the hollow tube forming the nozzle. The operator can bend the hose and hold pistol and electrode holder in one hand while he directs the air jet into the arc to augment the cutting action. A safety shield of non-conductive material protects his hand from the heat and showering sparks.

Advantages of Anctil's device are claimed to be:

(1) It cuts stainless steel welds faster;

(2) It leaves no carbon deposits;

(3) The arc is more stable and easier to control;

(4) There is no porosity or pitting after a cut;

(5) It removes the least amount of weld metal of any method tried;

(6) It can be used in any position;

(7) Less time and electrode metal are needed in repairing a flaw;

(8) The probability of quench cracks has been lessened.

* * *

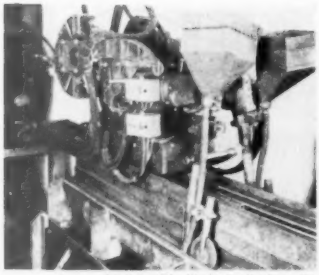
Welded Milk Tanks

SANITATION is obviously a necessity in equipment used for the handling and transportation of dairy products. That is why Heil milk truck-trailer tanks are made of sanitary stainless steel. The Heil Company, a Milwaukee manufacturer, fabricated the world's first welded stainless-steel milk tank back in 1927 and is today reported to be producing some 70% of all the milk-hauling tank trailers sold.

Bulk hauling of milk is becoming popular. Among other advantages, it cuts the weight of dead metal carried. Believe it or not, an empty 2,500-gallon Heil "trailerized" tank of stainless steel weighs only half as much as a trailer carrying a load of 250 empty 10-gallon cans. The milk tank increases payloads by 100 to 350 gallons of milk, saves time and labor in the loading and unloading of cargo. The improved quality of milk is important, too: there is much less metal in actual contact with the milk in a transport tank than in can containers of equal capacity.

Heil milk tanks protect their contents against spoilage by a 2½-in.-thick layer of insulation that keeps milk cool when there is hot weather outside. The insulation is covered with a hermetically sealed outer jacket. Both the inner and outer tanks are of high-strength 304 stainless steel. The combination of stainless sheets with a welded design is said to provide a lightweight, high-capacity tank despite the thickness of its insulation. Another advantage is a low center of gravity. The welded design eliminates tie bands, bolsters and subframes.

Heil tanks are built in six standard capacities of from 2,500 to 4,150 gallons. The larger sizes are supplied with tandem-axle suspension.



Courtesy The Linde Air Products Co.

TWO HEADS weld both sides of perforated tray 11 ft long. Welding time: six minutes

Dual Head Welds Both Sides

SILVER ENGINEERING CO., Denver, Colo., speeds up submerged-melt welding by mounting two welding heads on a single carriage. The carriage travels on a bridge beam suspended above the work. This simple method enables Silver Engineering to weld a tray 11 ft long in six minutes. Both side pieces are welded simultaneously to the perforated tray bottom. The sides are ½-in. plate; the bottom a ¾-in. plate with a width of 18 in.

Hold-down clamps in the welding fixture are activated by hydraulic pistons to hold the work. Copper strips beneath the joints back up the welds, allowing complete penetration. The bridge beam rolls over the fixture and can be locked in position. The operating switches for both heads are mounted on one side for convenience (see picture).

* * *

Million Cans Inert-Arc Welded

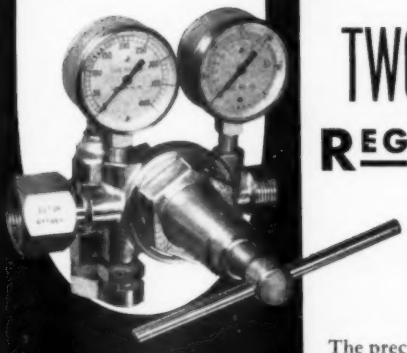
E. S. MACDONALD CO., Montreal, got a whale of a big order. It called for over a million five-gallon aluminum cans, to be delivered at the rate of 25,000 cans *a week* for a period of ten months. Purpose of so many cans? To carry acid from Montreal to rubber plantations in the Malay States.

The MacDonald people had trouble in their early experiments. For some reason, the trial welds simply weren't standing up as well as they should. Then technical experts from outside were called in to advise on the problem. The outside talent included R. St. Pierre, welding specialist of the Canadian General Electric Co., and Ivan McArthur, welding expert of the Aluminum Laboratories of Canada, Ltd., Kingston, Ontario. Four days after this brain trust had been brought into the picture, a procedure had been established for making quality welds with 100% penetration by means of inert-arc welding.

The cans were fabricated from type 57-SH aluminum sheet, 0.032 in. thick. Welding speed ran about 26 ipm, using 5 liters of argon per minute and a current of approximately 60 amp. A 3/32-in. tungsten electrode was used.

Two inert-arc welders and necessary holding fixtures were all the equipment the MacDonald plant needed to meet its schedule of 25,000 welded aluminum cans per week.

REGO



TWO-STAGE
REGOLATOR

Precision Regulation for
OXYGEN
ACETYLENE
HYDROGEN

The precision performance of the two-stage RegOlator is especially desirable for piped distribution systems and other applications where large volumes of high pressure gases must be controlled accurately.

Two-Stage RegOlator Gives You Plus Performance!

Constant delivery pressure regardless of drop in pressure at the inlet... Patented design incorporates nozzle-type first stage counterbalanced by stem-type second stage... Triple action cartridge filter eliminates troubles usually caused by rust, dust or dirt.

Listed by Underwriters' Laboratories, Inc. and Factory Mutual.

Write for complete information.

*Reg. U. S. Pat. Off.

The BASTIAN-BLESSING Company
4201 West Peterson Ave. Chicago 30, Illinois

PIONEER AND LEADER IN THE DESIGN AND MANUFACTURE OF PRECISION EQUIPMENT FOR USING AND CONTROLLING HIGH PRESSURE GASES

YOU CAN BE **SURE**.. IF IT'S
Westinghouse

JUNK COSTLY
Save 3 ways with

1. **Allowance on your old welder regardless of condition** — $25

2. **Savings in power costs alone for 1 year...and every year following*** — $126

First year savings that apply against cost of new D-C Welder — $151

*based on 2¢ per kwh, 33⅓% duty cycle, 40-hour week.

PLUS

3. ★ **Savings in maintenance costs...**
   ★ **No motor generator parts to repair...**
   ★ **Saves time...** ★ **saves space...**

OLD WELDERS
new D-C welder!

Westinghouse makes it easy for you to get the great advantages this all-new selenium rectifier D-C Welder offers. And *only* Westinghouse gives them to you!

SAVES $126 A YEAR IN POWER COSTS ALONE! No-load loss of only 500 watts, compared to 2480-3600 in conventional motor-generator welder.

SMOOTHER WELDING... less arc blow, easier arc striking, better weld quality.

SIMPLICITY CUTS MAINTENANCE COSTS! Only 3 basic elements—transformer, rectifier and reactor. Saves time, space and maintenance.

NO MOTOR-GENERATOR—NO NOISE! Lightweight, quiet selenium rectifier cuts maintenance costs, saves space.

FREE TRIAL! Ask your nearest Westinghouse distributor today about free trial installation or demonstration . . . or phone, write or wire Westinghouse Electric Corporation, Dept. DC-2, P. O. Box 868, Pittsburgh 30, Pa. J-21597

Westinghouse

D-C Welders

NEWS OF WELDING AND WELDING MEN

Story-High Welded Trusses For New York Hospital

ALL-WELDED 50-ton trusses, each a story high, will support nine stories of a new laboratory building addition to Mt. Sinai Hospital in New York City. With another 10-story laboratory building and an 8-story maternity annex for the hospital, the project will require 2,700 tons of structural steel and will cost $7,000,000. It will be the largest all-welded project ever awarded in New York City and is expected to set a nationwide precedent for welded building construction. Steel erection will begin in May.

Primary reason for choosing welding, according to Alfred Rheinstein, chairman of the hospital's building committee, is to spare hundreds of patients in the present hospital the discomforting noise of riveting. Recent revision of the New York building code concerning welded frameworks is expected to result in considerable economies, said Mr. Rheinstein.

The story-high trusses will span 53 ft. over a large clear basement area. Butt-welded joints will be used on them in place of the gusset plate connections formerly used in heavy construction welding. This new method, only allowable since the code revision of a year ago, transfers stresses directly from member to member. The welded joints and subassemblies were designed by Gilbert D. Fish, consulting engineer, who in 1926 designed the first large buildings of welded construction.

The additions are located on Ninety-ninth Street from Fifth Avenue to Madison Avenue, adjoining the existing hospital buildings. Plans were prepared by Kahn & Jacobs, architects, and Fred N. Severud, structural engineer. Construction will be by the Ingalls Iron Works Co.

* * *

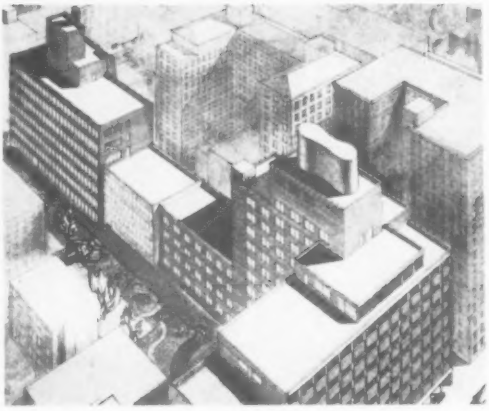
Schedule Speakers for Detroit Welding Conference

SECOND AIEE Welding Conference at Detroit, April 5-7, will have six technical sessions, morning and afternoon, and two evening demonstrations of welding techniques. All activities of the conference will be centered in Detroit's beautiful Rackham Memorial Building. Sponsors of the meeting are local sections of the American Welding Society, the American Institute of Electrical Engineers and the Industrial Electrical Engineers' Society of Detroit.

The evening sessions, Thursday and Friday, 5:30 to 10 p.m., will be featured by demonstrations of several inert-gas-welding processes, stud welding, submerged arc welding, a three-phase rectifier d-c arc welder, portable gun welding, resistance welding controls, etc.

The technical session program is:

Arc research session, 9:30 a.m., Wednesday, April 5. L. P. Winsor, Rensselaer Polytechnic Institute, Troy, N. Y., chairman. Speakers: Wolfgang Finkelnburg, Research and Development Laboratories, Fort Belvoir, Va.; J. D. Cobine and C. J. Gallagher, General Electric Co., Schenectady, N. Y.; T. B. Jones and Merrill Skolnick, Johns Hopkins University, Baltimore, Md.; G. K. Willecke, Lawrence College and Miller Electric Mfg. Co., Appleton, Wis.



ALL WELDED steel framework will support three-building addition to New York City's Mt. Sinai Hospital. Some trusses are story-high to carry nine floors. Butt-welded joints will be used to connect structural members. All shop connections and all field connections will be welded. Subassemblies and welded joints were designed by Gilbert D. Fish, who worked on the first large welded buildings in 1926. Contractor is the Ingalls Iron Works Co., which plans to start steel erection in May

Arc welding equipment, 2 p.m., Wednesday, April 5. J. H. Blankenbuehler, Hobart Brothers Co., Troy, O., chairman. Speakers: S. Oestreicher, Harnischfeger Corp., Milwaukee; G. R. Wagner, Bureau of Ships, U. S. Navy, Washington, D. C.; K. L. Hansen, consulting engineer, Milwaukee; A. C. Mulder and G. K. Willecke, Miller Electric Mfg. Co., Appleton, Wis.

Special welding processes, 9 a.m., Thursday, April 6. E. M. Guyer, Corning Glass Works, Corning, N. Y., chairman. Speakers: R. C. Singleton, Nelson Stud Welding Division, Morton-Gregory Corp., Lorain, O.; J. A. Kratz, The Linde Air Products Co., New York City; R. J. Bondley, General Electric Co., Schenectady, N. Y.; M. R. Shaw, Corning Glass Works, Corning, N. Y.

Instrumentation, 2 p.m., Thursday. R. C. McMaster, Battelle Memorial Institute, Columbus, O. Men who will speak are: C. B. Stadum, Westinghouse Electric Corp., Buffalo, N. Y.; N. P. Millar and A. A. Kavaliauskas, General Electric Co., Lynn, Mass.; E. F. Nippes and W. F. Savage, Rensselaer Polytechnic Institute, Troy, N. Y., and W. B. Kouwenhoven and W. T. Sackett, Jr., Johns Hopkins University, Baltimore, Md.

Resistance welding equipment, 9 a.m., Friday, April 7. W. G. Bostwick, Precision Welder and Machine Co., Cincinnati, O., chairman. Speakers scheduled are: D. L. Knight, National Electric Welding Machines Co., Bay City, Mich.; Jack Ogden, Fisher Body Division, General Motors Corp., Detroit; T. F. Ellis, Kaiser-Frazer Corp., Willow Run, Mich.; R. R. Rottier, General Electric Co., Schenectady, N. Y.

Power supply, 2 p.m., Friday. Co-chairmen are: H. W. Tietze, Public Service Electric and Gas Co., Newark, N. J., and W. K. Boice, General Electric Co., Schenectady, N. Y. Speakers: W. K. Boice; Lawrence Brieger, Consolidated Edison Co. of New York, Inc., New York City; R. C. Wilson, Trumbull Electric Mfg. Co., Plainville, Conn.; C. W. Wright, Delco Products Division, General Motors Corp., Dayton, O.

* * *

High-Frequency Welding Go-Ahead Given by FCC

A NEW ruling released by the Federal Communications Commission permits the use of high-frequency welding apparatus until Jan. 31, 1951. The welding industry has thus been relieved from a situation which at one time threatened to eliminate the new inert-arc process. The ruling also provides a period of five years for the correction of welders in use or in stock.

High-frequency equipment must be operated subject to the condition that the welding does not cause interference with authorized radio service. If it does, prompt steps must be taken to stop interference.

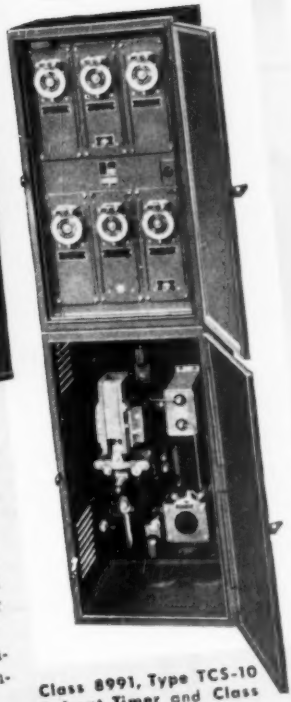
FCC released its decision after a year-and-a-half's study of radio interference problems caused by h-f welding equipment, with particular reference to inert-gas-shielded processes.

* * *

Bridgeport Brass Opens New Jersey Warehouse

THE Bridgeport Brass Company moved its warehouse facilities recently from Newark, N. J., to a new and larger location at Hillside, N. J. New warehouse will be in charge of N. H. Mosher, district manager.

Specify... SQUARE D Safront RESISTANCE WELDER CONTROL



FOR CONTINUOUS PRODUCTION—heavy duty rugged construction, hardened moving parts, and accurate, dependable pneumatic timer units.

FOR OPERATOR SAFETY—Safront panel construction isolates individual timer adjustments from live parts. Transformer provides 110 volts for all control circuits.

FOR MOUNTING FLEXIBILITY—Dimensions are standardized. Timers and contactors can be mounted in four different positions for wall or machine mounting.

FOR LOW INSTALLATION COST—Matching knockouts permit close coupling of enclosures, eliminating need for conduit run between contactor and timer.

FOR SIMPLIFIED MAINTENANCE—Accessible mechanical parts and easy coil replacement reduce "down" time and maintenance costs.

Class 8991, Type TCS-10 Safront Timer and Class 8990, Type SCG-2 Syncro-Break Contactor arranged for wall mounting. The same size, neat appearing enclosure is used for 4 and 6 period Safront timers and sizes 1W and 2W Syncro-Break contactors.

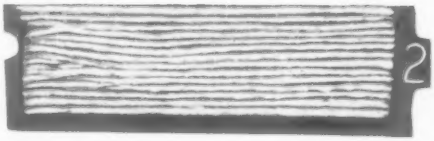
When extreme precision or speed is required—use Square D's Electronic Welder Control. Write for Bulletins 8990-8993 which detail the complete Square D line, magnetic and electronic. Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

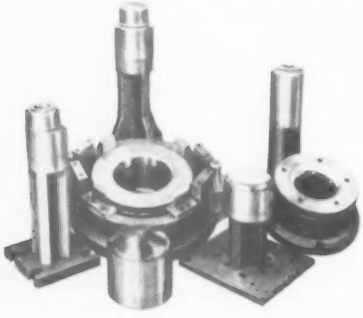
30% longer wobbler end life with Ampco-Trode overlays— The maintenance of rolling mill wobblers is a "natural" for Ampco-Trode 200. They must possess the ability to withstand tremendous loads and impact. The smooth deposit requires no grinding and has excellent bearing qualities. Wear-resistance combines with high compressive strength to take heavy loads without squashing, high impact without flaking.



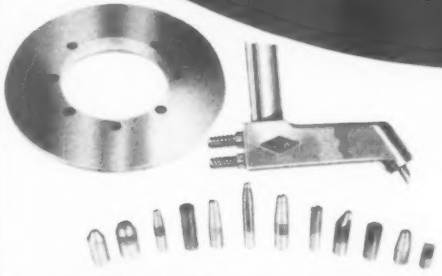
Ampco-Trode overlays more than double bearing shoe life — Locomotive roller-bearing shoes last thousands of miles longer with Ampco-Trode 200 overlays. Number 2 binders, the most severe location, last 80,000 miles — compared to 40,000 for phosphor bronze wear plates. Shoes in 1, 3, and 4 locations last 300,000 miles between shoppings. New shoes are given a two-layer, 5/16" overlay (3½ hours welding time); worn shoes are rebuilt with a one-layer, ¼" overlay (2 hours welding time).

Phos-Trode overlays save $4000 on one job — Twenty years of cavitation and pitting nearly destroyed the vanes and buckets on these 4-ton turbine runners. Replacement would have cost $6000 — had the original patterns been available. Rebuilt with corrosion-resistant Phos-Trode overlays, the turbine was as good — or better — than new, the original contours restored at a fraction of the cost of replacement.

Ampco Bronze



Ampco-Trode overlays outlast chrome plate 4 to 1 — A large Detroit manufacturer carefully counted the costs on these draw punches and rings. They found that overlays of Ampco-Trode 300 lasted 4 times as long as chrome plate. The longer life more than offset the lower initial cost of chrome. In addition, press-room efficiency increased nearly 15% by eliminating down-time previously required to hone and polish dies in the middle of production runs.



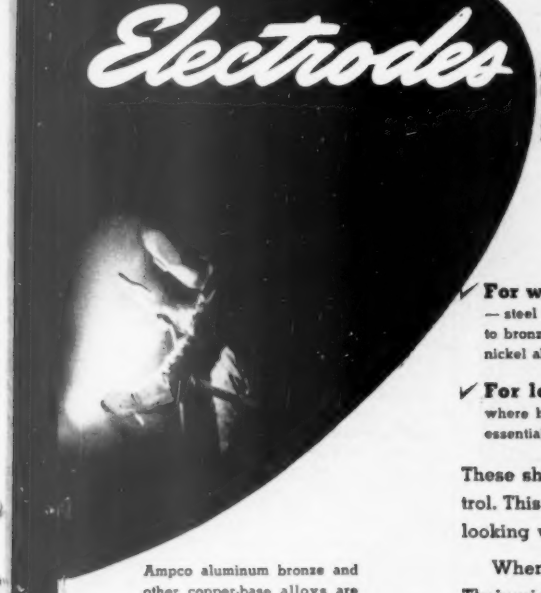
Resistance-welding costs cut with long-wearing Ampco electrodes — Rigorous production schedules call for trouble-free operation. Ampco resistance-welding electrodes are ideal for this kind of service. They combine hardness and toughness to resist mushrooming and wear. Their high electrical conductivity resists sticking to the work. They need less dressing — reduce downtime, increase production. The complete Ampco-weld line — tips, wheels, dies, standard and special holders — are made of alloys with the highest physical properties. All meet or exceed RWMA specifications.

Fabricated with acid- and corrosion-resistant Ampco-Trode — This conveyor was fabricated to handle bulk material saturated with 10% H_2SO_4 at 210° F. Specifying component parts of Ampco aluminum bronze alloys in varying grades met the severe requirements for corrosion resistance. The assembly was fabricated with Ampco-Trode 10 which matches the acid- and corrosion-resistant properties of the parent metal in the component parts.

Quick, low-cost repairs of cast iron with Ampco-Trode — This cast-iron road-grader housing was shattered when a drive-shaft broke. Replacements were not available, so Ampco-Trode 10 took over. All joints were V'd out, the welding done in two layers — the first with an 1/8" rod, the second with a 3/16". Only slight pre-heating was required. One of the breaks passed through a machined flange. But Ampco-Trode 10 provided a machineable deposit as well as proper strength and ductility. The repair job was solved easily and quickly — at a real saving in time and money.

AMPCO®

Electrodes save you time and money in fabrication, repair and maintenance — by making tough welding jobs easier



- ✓ **For welding dissimilar metals** — steel to clean cast iron; steel or cast iron to bronze, brass or copper; and all these to nickel alloys.
- ✓ **For corrosion-resistance** — extremely useful when fabricating process-industry equipment.
- ✓ **For long-wearing overlays** — where hardness and resistance to wear are essential factors.
- ✓ **For ideal bearing qualities** — mates against hardened steel without seizing or galling.

These shielded-arc electrodes are manufactured under strict laboratory control. This assures absolute uniformity. You can always count on sound, good-looking welds when you use Ampco Bronze electrodes.

When you are faced with a tough welding job, try Ampco electrodes. Their wide range of usefulness and flexibility are almost sure to give you the solution at a substantial saving in time and costs. See your nearest Ampco distributor. Send coupon for complete catalog of money-saving Ampco electrodes, and helpful information on welding techniques.

Ampco aluminum bronze and other copper-base alloys are available in a variety of grades to meet your exact requirements in the form you need: — rolled sheet or plates, sand or centrifugal castings, forgings or extrusions, resistance-welding electrodes, corrosion-resistant centrifugal pumps and plug-valves.

Free

Catalog W-17, "Welding with Ampco Bronze Electrodes"
Catalog No. 68B — Resistance Welding Electrodes and Alloys
Ampco Alloys for the Process Industries (CEC reprint)
Tear out this coupon and mail Today!

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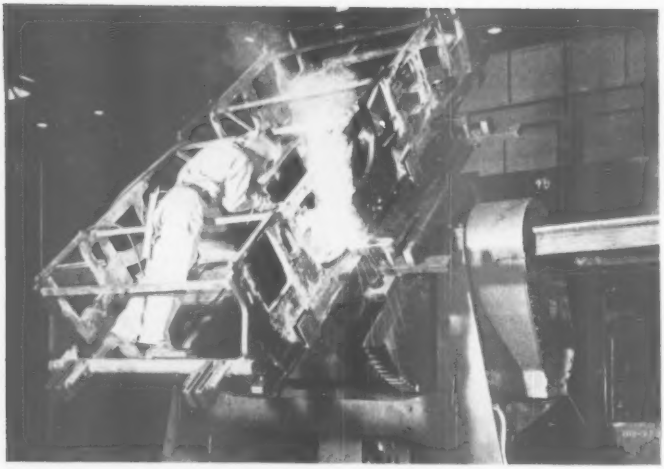
Ampco Metal, Inc., Dept. WE-4, Milwaukee 4, Wis.
I want the money-saving facts about Ampco Bronze electrodes. Send me, without obligation:
Check:
☐ Arc-welding Catalog W-17 ☐ Resistance Welding Catalog 68B
☐ Ampco Alloys for the Process Industries (CEC reprint)

Name _____
Company _____
Company Address _____
City _____ ( ) State _____



More Arc-Time Per Hour

You pay your welders for welding . . . so the time it takes them to *position* the work—or themselves—is *lost* welding time.

But a Worthington-Ransome Positioner quickly tilts and rotates the work for practically *continuous* welding—always in the efficient *downhand* position that permits using heavier electrodes for *quicker, neater, better* welds.

Mass production or job welding . . . small pieces or "crane" work . . . automatic or manual welding—Worthington-Ransome Positioners quickly *pay* for themselves with increased production, lowered labor costs—up to 50%.

Capacities from 100 lb. to 20 tons.

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WORTHINGTON PUMP AND MACHINERY CORPORATION

Welding and Assembly Positioning Equipment Division

DUNELLEN, NEW JERSEY

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50% PRODUCTION UP
Welding Positioners Turning Rolls
LABOR COSTS DOWN

Worthington Pump and Machinery Corp.
Dunellen, N. J.

Please send Bulletin 210C on Worthington-Ransome Welding Positioners.

NAME .....

COMPANY .....

ADDRESS .....

Big April Welding Show Planned for Atlanta

J. M. Tull Metal & Supply Co., Inc., Atlanta, Ga., will hold a three-day welding clinic and metal show on April 13, 14 and 15. Exhibits and demonstrations will be staged in the firm's new metal warehouse constructed at a cost of $750,000.

This show will be the largest and most extensive show in the southeastern United States, according to company officials. Many welding firms in Georgia and surrounding states have been invited to send representatives and to bring special welding problems.

* * *

Tube Turns Catalog Packed with Information

More than 5,000 items in the Tube Turns, Inc., line of seamless welding fittings are described in the company's 262-page catalog No. 211. Pictorial indexes, data tables, diagrams and graphs illustrate features of every size and type of fitting. Many views of installed fittings are included in every section.

Readable discussions include such subjects as pressure loss, properties of piping, refrigeration piping, pressure-temperature ratings, line expansion and flexibility, support and anchorage of piping, etc.

Bound in stiff covers, the catalog is printed on glossy paper. Edges of the pages are both tabbed and thumb-indexed for easy reference.

Copies may be obtained by writing on company letterheads to Tube Turns, Inc., Louisville, Ky.

* * *

Spot Welding Displayed On Westinghouse Road Show

"Productive Power," a traveling road show for demonstrating industrial uses of electricity, will be produced in 125 cities this year by Westinghouse Electric Corporation.

Spot welding of steel will be a major exhibit as will a movie on furnace brazing and radio-frequency heating in production line operations. Other displays will show the effects of wire size and circuit protection in factory distribution systems.

Effects of air pollution and how it may be overcome by electrostatic air cleaners will be another feature. Infra-red drying apparatus will be demonstrated as will be dielectric heating equipment.

First showing of the production was in Akron, O., in February. Final showings will be on the West coast in early 1951.

* * *

Alcoa to Roll Magnesium Sheet

A new division for the rolling of magnesium sheet will be established by the Aluminum Company of America at its New Kensington, Pa., works. Magnesium rolling was discontinued at New Kensington in 1947 because of a sharp drop in demand. The new division will provide jobs for about 100 additional employees.

Here's what the Industry is saying...

– about the WELDING ENGINEER's Mid-June Products Reference Number

BEAVER
Welding Supply Company
MEMPHIS, TENNESSEE
June 29, '49
The Welding Engineer
220 S. Michigan Avenue
Chicago 14, Illinois
Gentlemen:
I have just received my Mid-June issue of THE WELDING ENGINEER which is the 1949 Products Reference and Statistical Review Number.
This magazine, to my way of thinking, is one of the most important services you publish for the welding distributor. In it we not only have the names of all of the manufacturers of welding equipment and supplies in the country, but there is also a list of trade names which makes it much easier for the welding distributor to find the source of supplies requested by his customers. The list of addresses of manufacturers of welding equipment and supplies is also a valuable aid for the distributor.
I don't see how a distributor can properly serve his customers without having a copy of the Products Reference and Statistical Review Number of THE WELDING ENGINEER close at hand. You have rendered us a valuable service.
Very truly yours,
BEAVER WELDING SUPPLY COMPANY
L. P. Beaver, Jr.
LPB:jrjmf

"... don't see how a distributor can properly serve his customers without having a copy of the Products Reference and Statistical Review Number of the WELDING ENGINEER close at hand."

In two short years, the WELDING ENGINEER's Mid-June Products Reference and Statistical Review Number has gained industry-wide acceptance as the standard reference book for sources of welding equipment and supplies. Welding distributors, users, and manufacturers refer to it throughout the year.

The Products Reference Number is designed for you – it's the only buyers' guide specifically tailored to your daily buying requirements. The detailed listings of products, trade names, and manufacturers' addresses are an invaluable aid in locating the welding items you have to buy.

The descriptive product advertisements are a plus value in selecting your product needs. And they're conveniently placed next to the corresponding product classifications. Here you'll find helpful illustrations, specifications and applications – all designed to help you select the right product for your welding requirements. These advertisements offer a quick, easy reference to dependable sources of welding equipment, apparatus and supplies.

Whether you're looking for sources of welding items, or consulting the data on welding production, sales and markets, you'll find that it pays to keep your Products Reference and Statistical Review Number "close at hand."

WATCH FOR YOUR NEW 1950 PRODUCTS REFERENCE NUMBER. IT WILL APPEAR IN JUNE

THE WELDING ENGINEER

Mid-June Products Reference Number representatives

New York
C. H. Clarke
330 West 42nd Street
Tel. Longacre 4-3000

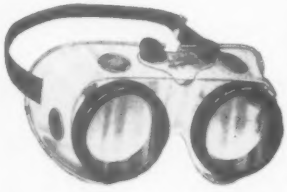
Cleveland
E. J. McOsker
1510 Hanna Building
Tel. Superior 1-7000

Chicago
T. H. Barry
520 N. Michigan Ave.
Tel. Whitehall 4-7900

Los Angeles
C. W. Dysinger
621 So. Hope St.
Tel. Michigan 3691

San Francisco
J. W. Otterson
68 Post St.
Tel. Douglas 2-4600

it's new!



it's a coverall

CLEAR PLASTIC

industrial goggle

The No. 612 Sellstrom Coverall Industrial Goggles were introduced less than two years ago. Since that time they have been tested by hundreds of users, who have voiced their approval by a steady stream of orders.

These goggles are designed to accommodate reading glasses of almost any type.

They are of one piece frame construction—can easily be handled by one hand—both eye cups move as a single unit.

The two center clamps permit adjusting to fit any face. The rolled edges assure utmost face comfort.

They are perfectly balanced, weigh only 2½ ounces, the weight is evenly distributed.

Made of tough plastic, and will render long service even under severe punishment.

The clear plastic offers wide vision, permitting the worker to observe others where men work close together.

Will accommodate any type 50 m/m lenses.

In the same style and size we offer two companion goggles: our No. 610 Coverall Welding Goggles and our No. 611 Coverall Grinding Goggles.

Write for our No. 610 folder, which fully describes and illustrates these three popular Coverall Goggles.

sellstrom

MANUFACTURING COMPANY

Offering more than
500 Eye and Face Safeguards

626 N. Aberdeen St., Chicago 22, Ill.

Welding School Featured At Purdue Conference

EIGHT hours of advanced welding instruction in either gas or arc welding are offered free to visitors at Purdue University's 21st annual Welding Conference on May 3 and 4.

Demonstration lessons on Wednesday and Thursday in oxyacetylene welding include eight subjects by the following instructors: high-temperature soldering, All-State Welding Alloys Co., Inc.; bronze welding of large castings, George H. Laws, Ruckman & Hansen, Inc.; die-cast white metal, V. A. Henry, Bendix Corp.; sheet and feder work, Virgil E. Lee, Smith Welding Equipment Co.; small size piping, George H. Laws, Ruckman & Hansen, Inc.; cast iron, J. W. Carrier, The Linde Air Products Co.; hand and machine flame cutting, C. A. Heffernon, The Linde Air Products Co.; cutting of stainless steel with powder flux, National Cylinder Gas Co.

Arc welding demonstration lessons will include: stainless steel, General Electric Co.; hard-facing, J. C. Menzies & Co.; overhead and special vertical welding, Robert Bercaw, head instructor, Hobart Brothers Co.; piping from 3 to 10 in. diameter, Robert Bercaw, Hobart Brothers Co.; high carbon and spring steel welding with low-hydrogen electrodes, Robert Bercaw; cast iron, The Lincoln Electric Co.; inert-gas-shielded-arc welding of aluminum and stainless, Air Reduction Sales Co.; submerged-melt welding by hand and machine, M. A. Teter, The Linde Air Products Co.

All prospective students of these two advanced welding courses are asked to bring their own helmets and goggles.

In conjunction with the conference there will be an exhibit displaying many types of welders, accessories and supplies. It will be open to the public in the Purdue Field House from 9 a.m. to 10 p.m. on May 3 and 9 a.m. to 5 p.m. on May 4.

Among speakers at the technical sessions are: C. B. Voldrich, chief welding engineer, Battelle Memorial Institute; H. E. Gannett, electrical engineer, Chicago, Burlington and Quincy Railroad; W. R. Plummer, sales manager, Progressive Welder Co.; Van Rensselaer P. Saxe, consulting engineer, Baltimore, Md.; Clyde G. Bassler, Taylor Winfield Corp., Chicago; Harry C. Boardman, Chicago Bridge and Iron Co.; Professor R. G. Sturm, Purdue University, department of engineering mechanics.

For further information on the conference, address C. E. Martin, chairman, Purdue Welding Conference department of general engineering, Purdue University, Lafayette, Ind.

* * *

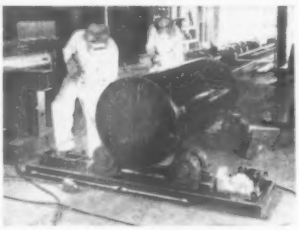
Taylor Forge Organizes Canadian Subsidiary

FORMATION of Taylor Forge & Pipe Works of Canada, Ltd., has been announced by Taylor Forge & Pipe Works, Chicago. The new subsidiary will be located at Hamilton, Ont.

Taylor Forge has pioneered in the manufacture of wrought steel fittings for welded piping, spiral welded pipe and heavy forgings for boilers and pressure vessels.

REED ENGINEERED JIGS and FIXTURES

for AUTOMATIC WELDING

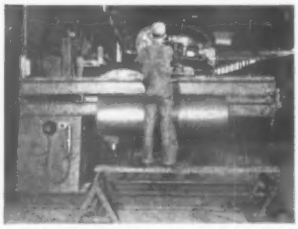


PORTABLE TURNING ROLLS

These rolls are built with variable speed drive and are available in 3-ton, 6-ton, 12-ton, 25-ton and 50-ton sizes. The 3-ton unit illustrated above sells for $925.00 complete with one power and one idler unit F. O. B. factory.

UNIT TYPE TURNING ROLLS

These machines combine both power rotation of work and track support for automatic welding head into one compact unit. Five standard sizes are available for welding tanks up to 10 ft. in diameter.



LONGITUDINAL SEAM WELDER

For high production welding on longitudinal seams, the Reed Horn Type Jig has no equal. This unit combines a copper backup with a mechanical toggle linkage to press the seam absolutely flat prior to welding.

The Above Machines and Many Others Are Shown in Our New Bulletin No. 65. A Copy Will Be Mailed at Your Request.

REED ENGINEERING CO.

CARTHAGE MISSOURI, U.S.A.

ENGINEERS AND MANUFACTURERS

Welded Storage Tanks Withstand Hurricane

THOUGH hurricane winds severely damaged oil drilling platforms in the Gulf of Mexico, they failed to harm several welded steel water storage tanks. According to *The Oil and Gas Journal*, the 295-bbl welded tanks were moved several feet from their footings by the storm but were not damaged. Two bolted tanks of 250-bbl size completely collapsed under the wind and waves; they were pronounced 100% losses.

The drilling platform on which the tanks were located belongs to the Ohio Oil company and is 6 miles off the Texas coast in about 47 ft. of water.

* * *

Nelson Stud Welding Div. Issues Dealer Franchises

FRANCHISES for the rental, sale and service of stud-welding equipment are being issued to dealers under a new policy. Leonard C. Barr, vice-president and general sales manager of Nelson Stud Welding Division of Morton-Gregory Corp., Lorain, O., said that the reason for the company's interest in dealers was the growing demand for stud welding equipment from construction industries.

* * *

Spot Weld Tests On Tin Coated Steel

SPOT and flash welding of tin-coated steel sheets and steel coated with a tin-zinc alloy is practicable under normal production conditions, according to tests conducted last year in Britain.

Flash welding was carried out on 0.05 in. thick mild steel sheet coated with tin, 50/50 tin-zinc and 80/20 tin-zinc of 0.0001 to 0.0003 in. thickness. No difficulty was encountered in the operation of the flash welder. Final appearance of the welds was satisfactory and properties of the joints compared to those for uncoated steels.

Spot welding tests were made with an automatic air-operated welder rated at 60 kva. Tests were conducted on both 0.05 and 0.01 thicknesses of metal, with coatings of the same composition and thicknesses as in the flash welding procedures. Conclusion is that spot welding of coated steels is practicable under normal conditions. It is advised, however, that automatically controlled welders and chromium-copper electrodes be used. A slight tendency toward tip pick-up was noted for the first few spots.

The fundamental difficulty encountered in spot welding coated sheets appeared to be the lowered contact resistance between sheets and a lowering of heat in this area as a result. This produces a temperature gradient across the sheets which may cause electrode and work surfaces to get hot. This difficulty, states the report, could be offset by setting the welder for maximum currents and minimum times, providing that excessive expulsion didn't occur.

The report was prepared by A. J. Hipperson, B. Sc., and P. M. Teanby. It originally appeared in *Welding Research*, the publication of the British Welding Research Association.

WeldOlets, Butt Welding — Available as standard, with outlet sizes from ⅛" to 24", both straight and reducing for use with Schedule 40 pipe up to 12" outlet. Outlet sizes 12" - 24" for standard weight pipe (⅜" wall). Also available for Schedule 80 services through 8" outlet and extra strong through 24" outlet size (for use with pipe having ½" wall).
24"-24"
BONNEY WELDOLET MADE IN U.S.A.

You write

SPEED, ECONOMY AND FULL PIPE STRENGTH

***into the job when you specify* WELDOLETS**

With WeldOlet branch pipe welding fittings you provide the quickest, most economical, most satisfactory method of obtaining full pipe strength at branch connections.

Note in the above illustration how the WeldOlet tapers to provide a single bevel groove joint at the crotch section and blends into a V-butt joint at the ear portion.

WeldOlets need no additional reinforcement to establish and fully maintain original strength on ASTM A-106 Seamless Steel Grade A Pipe, as set forth in Code for Pressure Piping, American Standards Association, B31.1-1942, and Supp. No. 2, B31.1-b-1947.

To meet special conditions, these fittings can be furnished in any forgeable metal including wrought iron, toncan iron, nickel, Monel, Everdur, stainless grades 304, 316, 347, etc.

For detailed engineering reference data, write for Catalog W-2.

BONNEY FORGE & TOOL WORKS

Forged Fittings Division, 364 Green Street, Allentown, Pa.

Authorized Canadian Factory Representative:
Sterling Steel Co., Ltd., 267 Davenport Road
Toronto 1, Canada

WELDOLETS

FOR WELDED BRANCH PIPE OUTLETS

WeldOlets, Socket Welding —Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedules 80 and 160 up through 4" outlet size.

ThredOlets — Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedule 80 up through 2" outlet size.

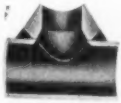


Fig. 1 — Cut-away view of reducing size WeldOlet with welding outlet in place. The external rib and wide bases or footings of WeldOlets eliminate the need for extra supports to take care of bending or vibrational stresses at crotch section, the point of greatest stress.

Fig. 2 — Note blending of ear portion of welding fitting to run pipe. Extension of weld metal below inside scarfed portion of pipe insures all sections of joint greater than pipe wall thickness.

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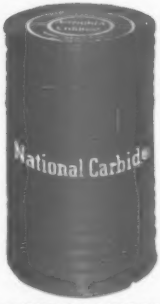

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Six versatile De-Sta-Co Toggle Clamps save in this simple, economical, plastics cementing fixture. The turntable more than doubles production . . . eliminates the cementing cycle "bottleneck."
These perfect reproductions are for a manufacturer of metal kitchens. This operation, cementing on tops, requires: Fast cementing cycle—positive clamping pressure for a perfect bond—precise alignment for accurate assembly.
De-Sta-Co No. 225-U fills these requirements. Completely retractable when opened for quick insertion and removal of work, it offers the rapid toggle action, positive holding pressure and accurate performance that make De-Sta-Co Toggle Clamps ideal "Model Tooling".
For your working-holding problems in Assembly, Welding, Bonding, Machining, Inspection . . . of any materials . . . tool up with these economical, efficient, high-production examples of "Model Tooling".
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Optimism Shown by NWSA At San Francisco Meeting

More than 50 distributors and suppliers attending the western zone meeting of the National Welding Supply Association in San Francisco, Feb. 10, agreed on hopeful prospects for this year. Business was up 13% over the same period last year, suppliers said, and the outlook was hopeful for distributors as well.

Chairman of the conference was Hal Savage, Arizona Welding Equipment Co., Phoenix, Ariz., senior vice-president of NWSA. A review of current association activities was given by Thomas A. Fernley, Jr., advisory secretary of NWSA at the beginning of the meeting.

J. Gordon Duff, Jr., assistant general manager, Gordon Duff, Los Angeles, discussed ways in which the manufacturer can assist the distributor in his sales effort. Spirited discussion on this topic brought forth requests for more advertising support from the manufacturers and better timing of new products campaigns. Other suggestions offered standardization of packages, identification on both package sides and better decoration, if possible.

The art of keeping receivable accounts down was the subject of a talk by Elmer Bakke, president-treasurer, Welders Supply Co., Inc., Seattle. Audience opinion agreed that cooperation among welding dealers on customer credit information worked best. Ordinary credit associations give slow or insufficient information on the type of customer who purchases welding materials, it was said. One dealer reported good results from simple printed cards sent to the customer's credit references.

Training of outside and over-the-counter salesmen was discussed by G. Milton Sims, Absco Welding Supplies, Los Angeles. Qualities considered in selecting distributors for his firm's products were revealed by A. E. Atkinson, Page Steel & Wire Division, American Chain and Cable Co., Inc., San Francisco. Answers to the question, "Can distributors be expected to carry and aggressively sell lines which do not provide an adequate margin?" were offered by W. T. Peters, Manager, Welders Supply Co., Portland, Ore.

* * *

Hoffman Company Reorganizes Operations

The Robert W. Hoffman Co., Chicago, recently reorganized and expanded its operations in the resistance welding field.

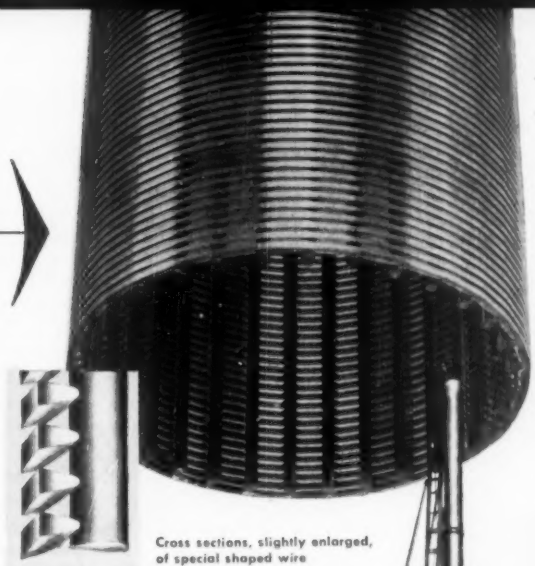
Robert H. Hoffman and P. Arthur Green, formerly of Chicago Welder & Machine Co., Hinsdale, Ill., consolidated their companies to offer a combined sales and service organization. New showroom, welding laboratory and welding shop of the Hoffman company is at 32-34 South Clinton St. in Chicago.

Achievements of Mr. Green and Mr. Hoffman in recent years include a butt-welding attachment for spot welders and a packaged air conversion unit for spot welders.

Officers of the firm include: Robert H. Hoffman, president and treasurer; Corinne V. Hoffman, vice-president and P. Arthur Green, secretary.

EVERDUR

Famous for exceptional resistance to corrosion, high strength, and adaptability to money-saving fabricating methods.



Cross sections, slightly enlarged, of special shaped wire and rod members.

Well screen being fabricated by unique method of resistance welding.

Micrograph of lengthwise section showing excellent fusion of Everdur resistance welds.

Johnson Well Screen, 16" O. D., 35' long, being lowered into well casing.

Longitudinal rods and outer wire in this Edward E. Johnson, Inc., well screen are both Everdur* 1010 and of special cross section. Fabrication of the screen is quickly and economically accomplished by rotating the rod assembly, thus winding on the wire and automatically welding wire to rod by electrical contact.

The circuit is arranged so that the rod assembly becomes one electrode, the other electrode being a copper roll which rides on the wire. As the latter touches each rod a surge of current welds the wire to the rod. Welding is at the rate of from 900 to 1700 welds per minute, depending on the size of the wire and rod. Only two or three cycles of current are required for each weld.

Everdur Alloys are non-magnetic and highly resistant to fatigue. Alloys are available which can be machined, hot-forged, drawn, stamped, spun, cast, electric-welded or oxy-acetylene-welded by all modern methods and equipment. For detailed information regarding compositions, properties, applications and advantages, ask for Publication E-5. Our Technical Department is at your service. Write The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 4958

*Reg. U. S. Pat. Off.

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A complete line of Welding Brushes for ALL types and makes of Welding Equipment — Keen-Arc Carbons (illustrated) for twin-arc torches — carbon and graphite welding electrodes — carbon rods, plates and paste — a complete line of replacement brushes for all motors and generators . . . plus the facilities and engineering staff to produce any electrical or mechanical carbons to your specifications. Write for catalogs.

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MEAN THAT YOU CAN

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3 in 1 "York's 77" SPECIAL FLUX

FOR...

GENERAL BRAZING

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CAST IRON BRAZING

NO NEED TO STOCK
3 DIFFERENT FLUXES
WHICH DETERIORATE
WHEN ONE CAN OF

"York's 77" 3 in 1 FLUX

MEETS ALL YOUR NEEDS

Make full use of the 4 famous features of "York's 77".
You will save money, save labor, and save time.

1 Fear of overheating can be forgotten.

2 Cleaning and grinding are unnecessary, because "York's 77" penetrates through grease, oxides, etc.

3 Chipping is unnecessary, because a satisfactory bond can be obtained on oxidized surfaces.

4 Deteriorated cast iron can always be welded successfully with "York's 77".

YORK ENGINEERING COMPANY 3349 OGDEN AVENUE CHICAGO 14, ILLINOIS

Balbach Welding Conference Draws 700 Attendance

More than 700 guests braved snowdrifts and subzero temperatures to attend the Balbach Company's welding conference in Omaha, Nebr., Feb. 14-16. An annual event, this conference includes welding exhibits, welding demonstrations and industrial information from welding manufacturers.

Thirty-seven representatives from manufacturers were on hand to give demonstrations. These men performed difficult welding jobs which guests brought in the hope of stumping them. Professor Leo Smith, of the South High School, made an entertaining demonstration of liquid oxygen and its properties.

Some of the guests traveled more than 400 miles from western Nebraska to attend. Charles Barrett, York, Nebr., the flying weldor and blacksmith, flew in for the event. Maintenance men, production weldors from Omaha factories, job shop owners and employees comprised most of the guest list.

Among companies taking part in the conference were: Stulz-Sickles Co., Jackson Products Co., J. M. Ragle Industries, Sight Feed Generator Co., Miller Electric Mfg. Co., Templeton, Kenly & Co., Bridgeport Brass Co., Metal & Thermit Corp., The Dockson Corp., Black & Decker Mfg. Co., Handy and Harman, Shawinigan Products Corp., The Stoody Co., Harris Calorific Co., Heath Engineering Co., Indiana Oxygen Co., Bay State Abrasive Products Co. and Lyon Metal Products Co.

* * *

Ductile Cast Iron Makes Strong Piping

The new ductile cast iron recently announced by The International Nickel Co., Inc. (April, 1949, issue of The Welding Engineer) is being put to practical use in water piping. Ordinary gray-iron pipe shattered at 2,400 psi in tests, while ductile iron pipe withstood up to 5,300 psi. At that pressure, failure took the form of a longitudinal crack along a bulge.

Pipe has been cast as large as 8 in. in diameter and 18 ft long with wall thickness of 0.42 in. The new iron is readily weldable, according to its manufacturer.

New Distributor Appointments

Hobart Brothers Co., Troy, O.: White Welding Supply Co., St. Louis, Mo., for metropolitan St. Louis and surrounding Missouri and Illinois counties.

Mir-O-Col Alloy Co., Los Angeles: The Elliott Sales Co., Metzer, Ore.

General Electric Co., Schenectady, N. Y.: The Drill Master Supply Co., Evansville, Ind., for welders, electrodes, and accessories.

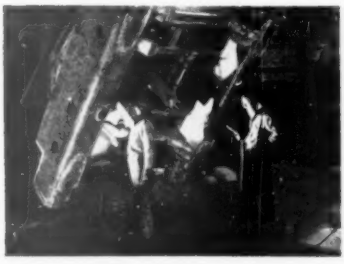
Industrial Overlay Metals, Inc., Eaton, O.: United States Steel Supply Co., Chicago, for "Dimaloy" coated tungsten carbide tubes and coated unfilled tubes.

Metal and Thermit Corp., New York City: Arc Welding Supply Co., Bronx 59, N. Y.; J. W. Goodliffe Co., Linden, N. J. E. K. Morris and Co., Cincinnati, O. J. E. Stroud Welding Supply Co., Amarillo, Tex.

P&H helps you

cut fabricating costs on "hard-to-weld" steels •

Have superior physical qualities — ideal for welding heavy sections that must withstand severe shock and abuse.



Low-Hydrogen Electrodes

- ***For problem steels:*** High carbon, high sulphur, cold-rolled, alloy... *70LA.*
- ***For steel castings repair;*** matches analysis and heat-treating properties of Grade B castings... *P&H25C.*
- ***For welding nickel-alloy steels;*** gives high impact resistance at low temperatures... *75LP.*
- ***For chrome-moly steels*** (1% Cr., ½% Mo.) used in power piping ... *80LE.*
- ***For chrome-moly steels*** (2% Cr., 1% Mo.) used in power piping ... *90LE.*
- ***To match heat-treating properties of SAE 1040*** and like steels. Also for steel-castings repair... *P&H40C.*
- ***For welding high hardenable steels.*** Also steel castings repair... *AW2B.*
- ***For repair welding Grade C castings*** and steels of similar composition... *P&H#7.*
- ***Comparable to SAE 8630 steel***...excellent heat-treating and flame-hardening characteristics... *90LH#2.*
- ***For welding high hardenable steels*** without preheat such as re-rolled rail stock... *P&H#12.*
- ***For aircraft and similar steels . . .*** has wide range of properties under heat treatments... *P&H#21.*

Withstand high amperages and have high deposition rate. Operators burn more rod per hour, weld faster at lower costs.

These rods operate with stable arc on AC or reverse-polarity DC. Other money-saving features are: Elimination of underbead cracking. Low hydrogen content for successful enameling. Little or no preheating. Minimum spatter. Excellent appearance of weld... freedom from surface holes. Order from your P&H representative or local P&H distributor. Send coupon for detailed information.

P&H WELDING DIVISION
Milwaukee 14, Wis.
HARNISCHFEGER CORPORATION

HARNISCHFEGER CORPORATION, Welding Division
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EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZER • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

Need top quality
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■ Each of our warehouses from coast to coast is ready to give you fast delivery service on **Stainless Steel Electrodes, Mild Steel Electrodes, Hard-Surfacing Electrodes** and all the other items in our large stocks of welding supplies.

Whenever you need Welding Rod, Welding Machines, Havens Protected "C" Clamps or Protect-O-Metal for eliminating weld spatter, phone, write or wire our nearest warehouse. You'll get **Service Plus.**

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No. 31 Grinders and Chippers Goggles

No. 335 Welders Coverspec Goggles

"CHAMPION"
EYEGARDS
with 10 way ventilation
NEXT BEST THING TO YOUR EYES

Giving your men the finest in eye protection doesn't mean you have to pay premium prices. Get Eyegard goggles and save the difference. They're the goggles that provide greater comfort because the lightweight plastic frame is molded to form-fit the face . . . greater protection because the goggles are impact-resisting . . . positive ventilation through three large vents at side of cup and seven additional vents around the lenses. Cool, and fog-free. With all their exclusive features, they cost no more than ordinary goggles. Get Eyegard "Champion" on next order.

Write for free catalog of Eyegard Equipment . . . it will save you money!

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DIVISION OF THE BURDETT OXYGEN COMPANY • CLEVELAND, OHIO

Ohio Welding Conference Set for April 14-15

OHIO State's annual welding engineering conference will be held at Ohio State University, Columbus, O., on Friday and Saturday, April 14 and 15. Theme of this year's conference is "Economy in Design and Production." More than 300 welding engineers, designers, and production men from Ohio and neighboring states are expected.

First day of the program will be devoted to papers on design for welding with economy advantages the keynote. W. R. Plummer, Progressive Welder Co., Detroit, will present a paper, "Design for Resistance Welding." William J. Phillips, director of the product development department, Steel Founders' Society, Cleveland, will discuss the design of high-quality, low-cost parts for industry. A. T. Waidelich, vice-president and manager of the research division, The Austin Co., Cleveland, will talk on the stress analysis of an 80-ft H-section welded truss.

On Friday evening, April 14, the Columbus Section of the American Welding Society will be the host for a dinner meeting at the Fort Hayes Hotel. Featured speaker will be Dr. Finn Jonassen, technical director of the committee on ship steel of the National Research Council, Washington, D. C.

Production methods will be theme of papers on the second day. E. C. Brekelbaum, executive chief engineer, Harnischfeger Corp., Milwaukee will speak on coordination of engineering and production in the manufacture of welded products. Arthur B. Tesmen, development engineer, North American Phillips Company, New York City, will give a paper on the use of contact electrodes. C. C. Kiefer, associate director of research, Allegheny Ludlum Steel Corp., Brackenridge, Pa., will present a paper on the welding of stainless steels. Lew Gilbert, editor of *Industry and Welding*, will discuss maintenance welding.

Downtown headquarters for the conference will be the Fort Hayes Hotel.

* * *

Welding Manufacturers At Philadelphia Show

MANY welding manufacturers will have exhibits at the Industrial Cost Cutting Exposition sponsored by the American Society of Tool Engineers in Philadelphia, April 10-14. Among those who have contracted for exhibit space are: Ampco Metal, Inc.; Bausch & Lomb Optical Co.; Bay State Abrasive Products Co.; Detroit Stamping Co.; Do-All Co.; Eastman Kodak Co.; Hammond Machinery Builders, Inc.; Handy & Harman; Haynes Stellite Co.; Magnaflux Corp.; C. A. Norgren Co.; Norton Co.; Oakite Products, Inc.; Simmonds Saw & Steel Co.

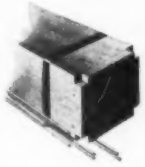
* * *

Moves to New Quarters

THE Interstate Welding Supply Corp., Cambridge, Mass., has moved to new and larger quarters at 37 Hurley St. Former address was 216 Broadway. W. L. Peterson is president and general manager.

WHEN IT COMES TO OXY-ACETYLENE WELDING AND CUTTING SUPPLIES

use the best!



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No. 28 (Pat.) Columbium-Bearing Stainless Steel
No. 32 CMS (Pat.) Steel
No. 7 Drawn Iron (Copper Coated)
No. 25M Bronze
No. 25M (Pat.) Flux-Coated Bronze
No. 31T (Pat.) Bronze
No. 19 Cupro
No. 26 Everdur Bronze
Tobin Bronze
No. 23 Drawn Aluminum
No. 14 Drawn Aluminum
No. 9 Cast Iron

HARD-FACING RODS
Haynes 90 Iron-Base
Haynes 92 Iron-Base
Haynes 93 Iron-Base
Haynes Stellite Cobalt-Base
Hascrome (Extruded) Iron-Base

"OXWELD" FLUXES...for all welding jobs

Brazo
Ferro
Cast Iron Brazing
Silicon Bronze
Aluminum
Aluminum Bronze
Cromaloy

"OXWELD" HOSE...highly resistant to abrasion, sun checking, and weathering. Light, flexible, and durable. Corrugated finish.

3/16-in. 1-Braid Oxygen
3/16-in. 1-Braid Acetylene
1/4-in. 2-Braid Oxygen
1/4-in. 2-Braid Acetylene
3/8-in. 2-Braid Oxygen
3/8-in. 2-Braid Acetylene
3/16-in. 1-Braid Rayon Fitted Hose
1/4-in. 1-Braid Rayon Fitted Hose
1/4-in. 1-Braid Double Hose (Two lines of highest quality, molded side by side into a single unit.)

"OXWELD" GOGGLES...provide maximum eye protection for all oxy-acetylene jobs.

No. 16, adjustable eye cups shaped to fit comfortably.
No. 17, for wear over ordinary eyeglasses.
Special flatground, polished lenses conform to all safety codes.

We have these **OXWELD** welding supplies, too . . .

Tip Cleaners
Friction Lighters
Wire Brushes
Leather Gloves, suede
Cotton Gloves, flame-resistant
Hose Connections
Adaptors
Asbestos Paper

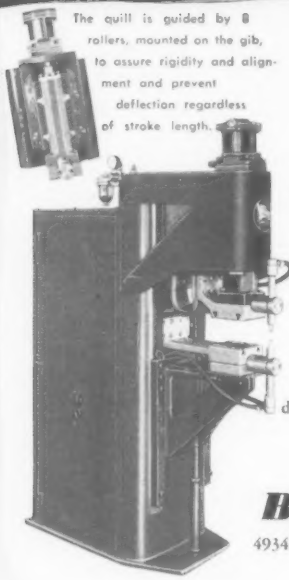
When it comes to oxy-acetylene apparatus, we have it, too! Contact your Linde office or Linde's local jobber.

Linde
Trade-Mark

The terms "Linde," "Oxweld," "Brazo," "Ferro," "Cromaloy," "Haynes," "Haynes Stellite," and "Hascrome" are trade-marks of Union Carbide and Carbon Corporation or its Units.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

NEW Banner Press Type Welder

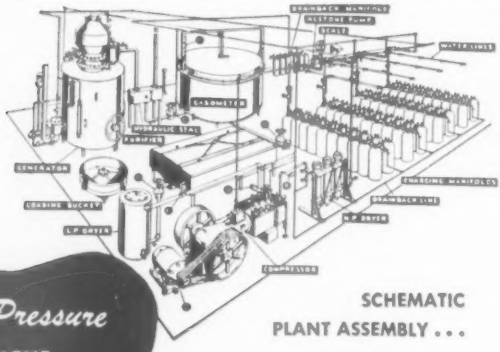


The quill is guided by 8 rollers, mounted on the gib, to assure rigidity and alignment and prevent deflection regardless of stroke length.

THIS new Press Type Projection and Spot Welder combines the most modern engineering developments in design and construction to provide performance superior to any unit presently available. It is big and husky with a heavy structural steel frame to withstand heavy-duty service. Unique, high capacity transformer is equipped with 8 stage, series parallel heat selector switch. Air line equipment mounted at top for easy access. Head completely shrouded from dust and dirt. Many other extra features. Available in 50-75-150 KVA. Send for full details.

Banner Mfg. Co.

4934-A N. 29th St. Milwaukee, Wis.



SCHEMATIC PLANT ASSEMBLY . . .

showing placement of the various units that comprise the plant.

A *Low Pressure* ACETYLENE PRODUCING PLANT that Charges up to 160 CYLINDERS at ONE TIME

This plant layout provides for *extremely* simple operation and exceptionally low maintenance costs. Ample storage space is also provided for filled tanks. Being compactly designed the chief operator has all operations under surveillence at all times. Rated capacity of this assembly is 2700 cu. ft. per hour.

We invite your inquiries

INDEPENDENT ENGINEERING COMPANY, Inc.

Manufacturers of

CONSULTING · DESIGNING · RESEARCH

CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

O'FALLON 5, ILLINOIS

Welding Goggle Maker Moves to Cleveland

AMERICAN Industrial Safety Equipment Co., has moved from 847 Lexington Ave., Brooklyn, to 3500 Lakeside Ave., Cleveland 14. The company, a subsidiary of The Burdett Oxygen Co., makes "Eyegard" goggles, spectacles, helmets, face shields and other safety equipment.

In its new location, the firm will be next to the Burdett Oxygen plant. Its new site will enable overnight shipment to practically any point east of the Mississippi river, say company officials.

* * *

Niagara Frontier AWS To Hold Welding Clinic

THE Niagara frontier section of the American Welding Society is planning a welding symposium on April 21-22 in Buffalo, N. Y. Technical sessions will be held Friday afternoon and evening and all day Saturday on the general theme of "Design for Welding."

Factory representatives and welding distributors plan to stage an extensive welding show of new techniques and new equipment.

Speakers on resistance, inert-arc, shielded arc, oxyacetylene and submerged melt welding will be heard, according to program chairman E. L. Frost.

Hotel reservations may be obtained through Frederick V. Schilling, Westinghouse Electric Corp., P. O. Box 2025, Buffalo.

* * *

"More Power" Train To Tour United States

THE "More Power to America Special," a new Diesel-electric streamlined train of nine cars, will carry more than 2,000 electrical products, including welders, on a nationwide tour this spring. General Electric Company's apparatus department is sponsoring the exhibit, which will be shown only to utility and industrial executives and municipal leaders.

Years in the planning, the exhibit train division was set up in early 1949 with responsibility for preparation and operation of the train. This division is managed by Clayton P. Fisher, Jr., formerly manager of the company's apparatus news bureau.

Arc welders and welding equipment are one of the eleven major categories into which the train displays are divided. Also included are turbines, equipment for transmitting and distributing electric power, motors and controls, etc.

* * *

Curtis W. McGraw Elected President of McGraw-Hill

FOR REASONS of health, James H. McGraw, Jr. has resigned as president and chairman of the McGraw-Hill Publishing Co., Inc., publisher of THE WELDING ENGINEER. He is succeeded by Curtis W. McGraw, who has been elected chairman of the board and president. At the same board meeting, Willard Chevalier was elected to the newly created post of executive vice-president. Joseph A. Gerardi was elected treasurer to succeed Curtis W. McGraw.

"NI-ROD is good!"

says Jim Bengough

"I've been welding for 20 years and never thought it possible to get a rod to work as well on cast iron as NI-ROD does."

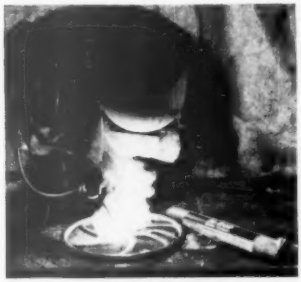
Here at Jim's Machine Shop in Hensall, Ontario, we do a lot of repair work, especially on farm machinery. A large part of this work calls for welding cast iron parts . . . frames, broken gear teeth, wheel spokes, and so forth.

So . . . we've *got* to have a dependable welding electrode: one that will do a good job fast, with little or no preparation. And Ni-Rod® certainly fills the bill!

To give you an idea how useful Ni-Rod is around our shop, I've had pictures taken of a few of our jobs. You'll find them on this page.

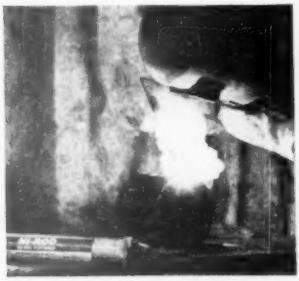
I can recommend Ni-Rod to anyone who needs a good, easy-handling electrode for general cast iron welding, and joining cast iron to steel.

Reg. U. S. Pat. Off.



WELDING A CREAM SEPARATOR WHEEL. With Ni-Rod, we didn't have to preheat, so distortion was kept to a minimum. We welded the wheel hub and built up a couple of broken gear teeth.

MACHINING A NI-ROD WELD. The Ni-Rod weld deposit can be machined with ordinary tools. In fact, it machines as well as the iron itself.



HAY PRESS BULL PINION SAVED BY NI-ROD. On jobs like this Ni-Rod is ideal because you don't have to take chances with distortion by preheating or postheating.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

NI-ROD REPAIRS BROKEN PUMP JACK. Another reason we like Ni-Rod . . . it has almost no spatter. Current is no problem either. Ni-Rod can be used with AC or DC.

EMBLEM OF SERVICE
INCO
TRADE MARK

NI-ROD DISTRIBUTORS

Alloy Metal Sales, Ltd.	J. M. Tull Metal & Supply Company	Whitehead Metal Products Company, Inc.
Robert W. Bartram, Ltd.		
Eagle Metals Company	Pacific Metals Company, Ltd.	Wilkinson Company, Ltd.
Metal Goods Corporation	Steel Sales Corporation	Williams and Company
Metal & Thermit Corporation	**National Cylinder Gas Company**	**Hollup Corporation**

"METAL ZIPPER"

Mid-States AC WELDERS

features that Save You Time and Money

- Fully Portable.
- No "Moving" Parts—No Creeping.
- Extra Heavy-Duty Construction—5-year "Burnout" Proof Guarantee.
- 1-second Heat Changes.
- Up to 66 Heat Settings.
- Positive Heat Control with Settings as Low as 7 Amperes.

Model 500U Illustrated (Underwriters Laboratories approved) with "Missing Link" High Frequency Arc Stabilizer.

Mid-States "Metal Zippers" are literally one-unit welding shops because of their superior performance through a wide range of work—from the lightest gauge to heavy castings and plate—ferrous and non-ferrous.

Brazing, soldering, hard surfacing, heating and other operations are easily handled, too. With Mid-States "Metal Zippers," operators do *better* work *faster*, with less effort and fatigue.

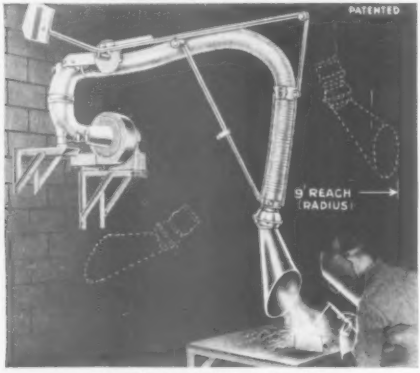
For the finest "all-around" equipment with capacities from 7 to 300 amps in close amperage ranges, your best-buy is Mid-States "Metal Zipper"—the low initial cost will surprise you.

Territories open for jobbers and representatives. Write today.

See your jobber or write us for details.

MID-STATES WELDER MFG. CO.
6025 SO. ASHLAND AVE., CHICAGO 36, ILLINOIS

"It certainly is a relief to have fumes and heat removed while I'm welding. The Ruemelin Collector has great suction. It makes a day's work pleasanter!"



Ruemelin Fume Collector in operation.

Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated at their source, thus improving working conditions, lessening fatigue and paving the way for increased plant production.

The Ruemelin Fume Collector hood can be instantly placed where needed anywhere in the booth welding area. No tedious adjustments necessary. Just pull the inlet hood to the welding position and you are ready to go. Approved by state industrial commissions and by compensation insurance companies. Simple to install. Thousands in service. Many users send in repeat orders. Write for bulletin 37-D today.

RUEMELIN MFG. CO.
MANUFACTURERS AND ENGINEERS
SAND BLAST AND DUST COLLECTING EQUIPMENT
3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

IAA Committee to Set Up Welding Hose Standards

STANDARDS for welding hose are in the offing. The oxyacetylene committee of the International Acetylene Association has started on a cooperative program with the Rubber Manufacturer's Association, Inc., to work up a suitable set of standards. The standards will be tested for a number of years before they are offered to the American Standards Association for adoption. The final standards will be issued in the name of the Rubber Manufacturer's Association.

* * *

An Oven 600 Ft Long Dries P&H Electrodes

AN OVEN with 600 lineal ft of processing space has been placed in service by Harnischfeger Corp., Milwaukee, to dry coated electrodes. The largest of its kind known, the new oven has six separate temperature zones, each equipped with separate humidity, temperature and speed controls. Processing time can be varied from 20 to 120 minutes for the precise requirements of various P&H electrodes. Temperatures may be varied from 70 to 1,000 F.

A new electrode extrusion press of latest design has also been installed by Harnischfeger. It is capable of taking the full capacity of the company's new baking oven.

* * *

1950 Metal Show To Run Oct. 23-27

THE 32nd annual National Metal Congress & Exposition, the "Metal Show," will open in Chicago's International Amphitheatre Oct. 23 and will last until Friday, Oct. 27.

Curtain-raiser for the show will be the American Society for Metal's annual seminar. Scheduled for Saturday and Sunday, Oct. 21-22, the subject discussed will be "Diffusion."

Sponsors of the show are the American Society for Metals, the American Welding Society, Metals Branch-American Institute of Mining and Metallurgical Engineers and the Society for Non-Destructive Testing.

* * *

Templates for Clamps Simplify Drafting

A COMPLETE kit of clamp templates in half size will simplify the draftsman's job on production blueprints. Rather than take the time to scale down the full size template to half-size blueprints of jigging and holding procedures, he can slip the half-size template under the vellum and trace it.

Each template shows six views, front, side and top of right and left hand applications, and gives dimensions. The kit is free of charge to anyone writing for it on his company stationary to Lapeer Mfg. Co., Lapier, Mich.

* * *

Budd Builds Gary Plant

THE Budd Company is building a new $7,000,000 plant at Gary, Ind., to make auto body parts. The factory will have 320,000 sq ft of floor space. Its equipment will include sheet-metal stamping presses and resistance welders.

PAGE *Welding* ELECTRODES

a NEW line of Page-Allegheny AC-DC Stainless Steel Electrodes

ANOTHER STEP FORWARD IN WELDING STAINLESS!

they're NEW

... **BUT** they've been "given the works" by many large fabricators of stainless steel equipment—on the job. And, from all reports, they're the most all 'round satisfactory electrodes PAGE ever developed for any kind of weld on any type of stainless steel. And PAGE has been making stainless steel electrodes since the early development of stainless.

Ask your Page distributor about these new, improved Stainless Steel Electrodes

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

TRADE MARK

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Get in touch with your PAGE Distributor

For Quick, Efficient On-Location Clamping Use Knu-Vise Portable Vises

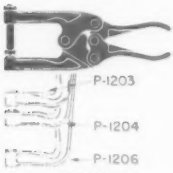
P-400

For clamping when space is limited

Equipped with various spindle types—steel or copper, or rubber capped

FGP-400

Spindle automatically adjusts itself to total thickness of materials held



P-1203

P-1204

P-1206

P-1200

Available in 4 standard throat gaps—1⅝", 2¹¹⁄₁₆", 3½" and 6"

Whether you clamp tiny parts requiring pressures of a few pounds or want to hold together huge assemblies that need pressures of around 1800 pounds, Knu-Vise Toggle-action pliers will provide the dependable service you need.

Made to most exacting specifications resulting from exhaustive laboratory tests and years of practical use among leading industries.

Models with special throat gap or throat depth, special anvils and spindles, on request.

Ask for complete catalog

Consult us direct or our representative engineer near you

Buffalo, N. Y., J. H. England
Chicago 20, Ill., Larry P. Wood
Columbus, Ohio, Arthur Gangloff
Dallas, Texas, C. G. Wilson Co.
Dayton 2, Ohio, W. F. Grimes
Glendale, Calif., Art Lewis Prod. Equip., Co.
Houston, Texas, L. H. Creasy
Indianapolis, Ind., E. M. Lewis
Kansas City, Kansas, L. N. Wood
Milwaukee 9, Wis., K. W. Stoffregen
New York 17, New York, V. A. Chorn
Oakland, Calif., Bues Prod. Equip. Co.
Philadelphia, Penn., Jackson-Walter Company
Seattle, Washington, Norwes Company
St. Louis, Mo., Moehlenpah Engr., Inc.
Warren, Ohio, P. L. Duer

KNU-VISE PRODUCTS **LAPEER MANUFACTURING CO.**
3056 DAVISON ROAD • LAPEER, MICHIGAN

Safer...at no added cost

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Safe-T-Chek

REGULATORS

The MECO Safe-T-Chek is the only regulator with a *built-in*, self-actuating safety valve that controls excessive pressures due to careless handling or failure of seating. This *built-in* safety feature comes to you at no additional cost. See your MECO Dealer TODAY.

FREE—Write for your copy of the NEW MECO Catalog No. 140 TODAY.

Meco **"Always specify MECO... the finest in the field"**

Modern Engineering CO., Inc.

3411-D PINE BLVD. ST. LOUIS 3, MO.

About People

ED F. CUMMISKEY, Arlington Heights, Ill., has been appointed factory representative of Tweco Products Company in the four state area of Illinois, Indiana, Michigan and Wisconsin. Before joining Tweco, he was in the sales and advertising department of the Do-All Corp.

* * *

E. N. LUCKEY has been appointed general sales manager of the Dockson Corporation, Detroit. For 10 years prior to 1942, Mr. Luckey was a top ranking salesman for Dockson. Until rejoining Dockson in early 1950, he operated his own business, Industrial Safety Equipment Company in Baltimore, Md.

* * *

DR. WILLIAM G. THEISINGER has been named regional sales manager for 12 southern states for Lukens Steel Co. His headquarters will be in Houston, Tex., and his territory extends from South Carolina to California. He joined Lukens in 1935 as a welding and metallurgical engineer, becoming director of welding research in 1941. Dr. Theisinger has worked with the Board of Transportation of the City of New York in the development of welding inspection and with Western Pipe & Steel Company, San Francisco, as consulting engineer on high-amperage automatic welding.

* * *

CHARLES E. ROGERS has been promoted to sales metallurgist for the Stoody Co., Whittier, Calif. For the past three years he has been in charge of the company's metallurgical laboratory. PAUL IRISH has joined Stoody as plant metallurgist. Prior to coming with Stoody he was with The Pacific Car and Foundry Co., Renton, Wash., and Bethlehem Steel Co., Seattle.

* * *

EDWARD DASH has joined the Shielded Stud Welding Co., 124 West Fourth St., Los Angeles, as consulting engineer. Formerly a welding engineer with the Long Beach Naval Shipyards, he is now working with aluminum stud welding.

* * *

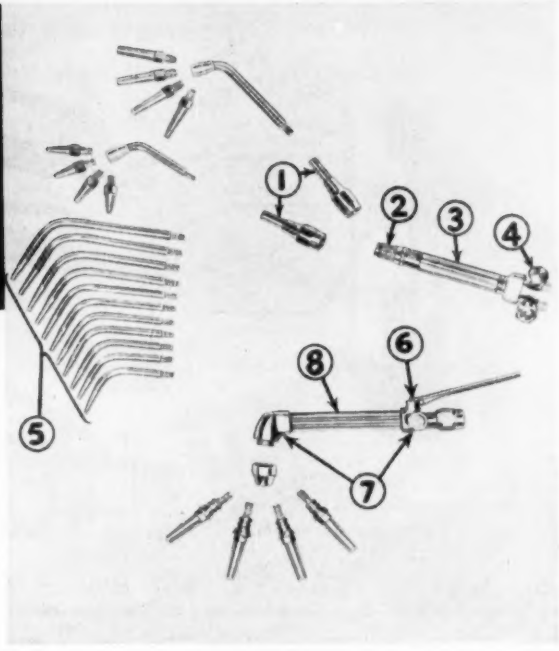
WILLIAM J. POWERS, who has been acting manager of the clad and conversion sales department, Lukens Steel Co., Coatesville, Pa., has been appointed manager.

* * *

C. L. STOCKNER has been named to head the San Francisco office for Lincoln Electric Co. He started with Lincoln in 1930 and has been district manager of the Seattle area since 1943. His welding engineering staff at San Francisco has been increased by the addition of M. F. YALE and T. NICHOL. A. L. PATNIK has taken over the Seattle district.

Here's the Torch you've always wanted!

The NEW K50 TORCH and CUTTING ATTACHMENT



New Advantages designed in!

Old Troubles designed out!

THE features shown are but a few of the many advances you get in the New K50 Torch and Attachment. They provide lighter weight, more compactness, better balance, easier handling, precision control, greater durability, less repair and replacement cost. Cutting range, up to tip size 40, approx. 6". Welding, up to tip size 20, complete welding range. May be used with all tips, extensions and goosenecks you now use with the well-known K Torch. Before you buy another Torch, be sure to see the new K50 at your distributor. Literature on request.

K50 TORCH

1. Universal Helical Mixer accommodates all swaged tips from drill sizes 75 to 30, inclusive. Ample volume on two mixers for every tip manufactured for this or the well-known K Torch.

2. Solid Monel Head on torch in conjunction with brass seat in mixer, assures non-galling, positive seating.

3. Deep Fluted Handle gives better, surer grip.

4. Valve Assembly has swiveled conical needle valve seat of Tobin Bronze for perfect alignment in seating. Replaceable needle valve body for low cost repairs. Needle valve handles widely spaced and deeply fluted for easy adjustment even with welders' gloves.

5. Extra Heavy Tubing used in swaged tips, for good conductivity and strength.

KA50 ATTACHMENT

6. High Pressure Valve Assembly of unique design, embodying "O" ring of Neoprene, prevents gas leakage found in conventional construction.

Designed to provide Monel to stainless bearing points.

7. Forged Head and Body.

8. Nickel-Silver Tubes

Note: All joints are silver soldered, except needle valve bodies and cone connectors.

Equally outstanding!

The NEW E50 TORCH

and CUTTING ATTACHMENT

Torch, with attachment and tips, weighs only 32 oz. Cutting range, to tip size 45, approx. 3". Welding, to tip size 40, approx. ½".

K-G WELDING AND CUTTING COMPANY, Inc.

515 West 29th St., New York 1, N. Y.

Sold in Canada under the name "WELDCO"
by Welding and Supplies Co., Ltd., Montreal and Toronto

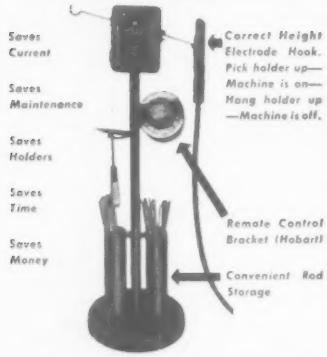
NATIONAL WELDING SUPPLY ASSOCIATION MEMBER

A UNIT OF Air Products INC. OXYGEN GENERATING EQUIPMENT

K-G ... for 35 years, symbol of satisfaction on GAS WELDING AND CUTTING EQUIPMENT

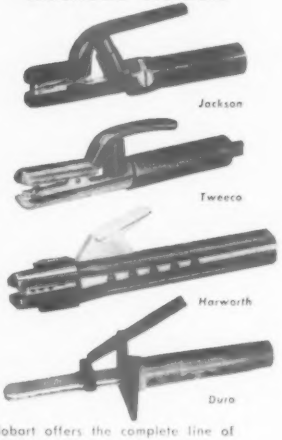
SAVE MONEY with HOBART accessories

Electro-Mizer



The Electro-Mizer is a Remote Stop-Start Switch combined with other "at-hand" conveniences. Write for amazingly Low Price and Data Sheet.

Electrode Holders



Hobart offers the complete line of Nationally advertised Holders.

For additional Information on Hobart Accessories see your Hobart Distributor or write

HOBART BROS., BOX U-401, TROY, OHIO

The Welders Favorite

THE IMPROVED "ROUND FILE"

GAS LIGHTER

Many superior designs and construction features combine to make the Improved "Round File" the most efficient and economical torch lighter.

An unusually large file area (approx. one sq. in.) is provided. The file is of superior quality, hardened in our own factory. Spark metal is of large diameter and the patented cartridge holding the metal locks exactly into position, permitting instant replacement.

SAFETY GAS LIGHTER CO.
(Est. 1901)
LYNN, MASSACHUSETTS

1100 and 1200 SILVER BRAZING FLUX

NON-CRYSTALLIZING
SMOOTH IN TEXTURE
QUICK IN ACTION

1200 ALL PURPOSE FLUX For use on all metals . . . No. 1200 Flux readily dissolves oxides during brazing operations and aids in the flowing of the alloy. Meets all government specifications.

1100 LOW TEMPERATURE FLUX Superior where exceptionally clean surfaces on copper or copper alloys are required at lower temperatures. No. 1100 Flux gives remarkable coverage and is unmatched in performance by any flux on the market.

½ lb., 1 lb. 5 lb. jars and in 30 lb. containers.

DISTRIBUTED BY
STEEL SALES CORPORATION

WILLIAM B. MCFERRIN has been appointed division executive vice-president and ROBERT M. BRINEY has been appointed division vice-president in charge of wrought alloy products, Haynes Stellite Division, Union Carbide and Carbon Corp., Kokomo, Ind.

* * *

WILLIAM DUBILIER, president of Koldweld Corporation, has been awarded the Chevalier Cross of the French Legion of Honor, according to formal announcement from Oleg Yadoff, honorary president of the Association des Ingenieurs-Docteurs de France.

* * *

HARLAN W. BURBANK has been named district representative for the Federal Machine and Welder Co., Warren, O., for the southern part of Ohio, western West Virginia and the State of Kentucky. He recently represented the company in Mexico City, Mexico. His office there will continue in operation with E. L. STINYARD in charge.

* * *

A. D. FREEMAN has been named sales manager of Industrial Air Products Co. of Portland, Ore. He will direct sales and promotion for the Portland office, Spokane, Washington and Medford, Ore. Mr. Freeman was formerly district manager of the San Francisco office of Stuart Oxygen Co.

* * *

J. LYELL WILSON, recently retired as research director of the American Bureau of Shipping, has opened a consulting office in naval architecture, marine and welding engineering. His headquarters will be at 145 Clifton St., Westfield, N. J.

Mr. Wilson's qualifications include experience with the New York Shipbuilding Corporation, Lake Torpedoboat Company, Talbot Boiler and Engine Corporation and 33 years with the American Bureau of Shipping. He has worked with the bureau of ships, U. S. Navy and the Ship Structure Subcommittee. A member of the American Welding Society and Welding Research Council, he has been a member of many committees on welding procedure, inspection, filler metal, metallizing and welded marine construction.

* * *

G. L. REVELL has been named sales manager of Cal-Metals, Inc., a Los Angeles pipe fabricator. Mr. Revell was employed with The Lincoln Electric Company for more than 14 years in Oregon, Montana and southern California.

* * *

JACK GODLEY has been named Washington, D. C., manager of the Nelson Stud Welding Division of Morton Gregory Corp. He will coordinate all work with government services, agencies and bureaus which involve stud welding applications.

* * *

DIED . . .

WILLIAM PHILIP SIEG, founder and former president of the Titan Metal Mfg. Co., Bellefonte, Pa., died on Jan. 27.

WELDROD COATINGS + RUFLUX =
SATISFACTORY WELD ELONGATION
For welds of satisfactory elongation, the inclusion of Ruflux S in welding rod formulation is especially desirable. Increased density, strength and endurance are realized also. Welding is speeded. Proper slag formation is promoted. Arc stabilizing properties make Ruflux S even more desirable.
A sodium titanate compound, Ruflux S contains approximately 80% TiO_2 and 15% Na_2O. Specific gravity is 3.93. Mesh size is about 2% on 200 mesh. Weight per cubic foot is 48 lbs.
Write our sales department for detailed information. It will be furnished immediately upon request.
RUFLUX S
WELDING ROD COATING
TAM
Registered U. S. Pat. Off.

TAM and RUFLUX S are registered trademarks.

TITANIUM ALLOY MFG. DIVISION
NATIONAL LEAD COMPANY
Executive and Sales Offices: 111 BROADWAY, NEW YORK, N. Y. • General Offices and Works: NIAGARA FALLS, N. Y.

THE NEW IMPROVED

COMMANDO POSITIONER

Ideal for holding plow shares and other parts while welding or hard facing. Stays "put" in any position.

Also Commando Rods, Tip Drill Kits, Hand Cleaner and other fast-selling items.

YOUR WELDING SUPPLY DISTRIBUTOR CAN SUPPLY YOU.

MANUFACTURED BY

J. M. RAGLE INDUSTRIES

4029 INDIANA KANSAS CITY, MO.

SHAWINIGAN CARBIDE

SHAWINIGAN PRODUCTS CORPORATION

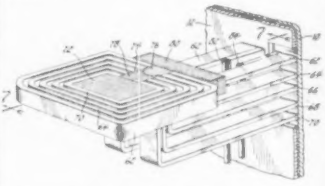
EMPIRE STATE BUILDING

NEW YORK 1, N. Y.

From the Patent Office

H-F Inductive Welding

2,493,950. WILLIAM G. DOW and HAROLD C. EARLY, Boston, Mass., and HENRY J. GOMBERG, Washington, D. C. Assigned to General Motors Corp., Detroit, Mich. Filed Dec. 1, 1944. Granted Jan. 10, 1950.

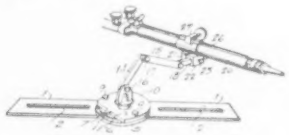


Patent pertains to high frequency welding apparatus with a number of conductors so shaped as to form concentric pieces of a workpiece platform. The platform has an opening through it at one point. A source of high frequency power is connected to the conductors. Magnetic laminations in the platform opening partially fill it. Non-magnetic laminations take up the remainder of the opening in the platform. These latter laminations concentrate the current in and cool the surface of the work respectively.

* * *

Adjustable Torch Holder

2,494,698. DONALD L. FORREST, Fort Worth, Tex. Assigned five per cent to Fort Worth Structural Steel Co., Fort Worth, Tex. Filed Sept. 24, 1945. Granted Jan. 17, 1950.



Recently patented cutting torch holder for making angular cuts on piping and tubing includes a slotted base plate for adjustable securement to a table. The circular base member has a circular groove formed in its face and a radial series of graduations adjacent to the groove. An indicator plate pivots on the base member. In the center of the indicator is a integrally supported bracket. A number of pivotally connected arms are secured to the bracket and are capable of fixed angular adjustment with respect to it. A torch holder bar having graduations on it is pivotally connected to the outermost of the arms. The torch holder is slidably adjustable with respect to the graduation on the bar. The holder is also capable of horizontal pivotal adjustment.

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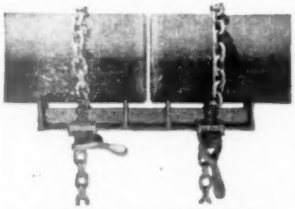
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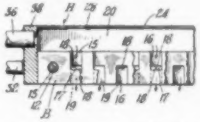
Laminated Torch Head

2,484,123. Egon B. Scheri, New York City. Assigned to The Linde Air Products Co. Filed January 29, 1948. Granted October 11, 1949.

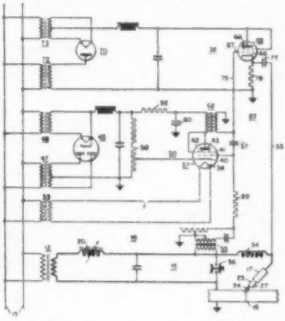


Patent pertains to a torch head composed of a stack of metal laminations. A pair of adjacent laminations have serrated edges disposed oppositely each other so that the serrations are in communication to form fluid passages. Another pair of adjacent laminations have longitudinal slots, portions of which communicate with each other to form conduits. All laminations are fastened together in gas-tight relationships. One fluid supply is connected to the fluid passages and another to the conduits.

* * *

Arc Welding Circuit

2,482,473. Kenneth N. Fromm, Pittsburgh. Assigned to Westinghouse Electric Corp., East Pittsburgh. Filed November 3, 1948. Granted September 20, 1949.



Patent pertains to an arc welding system including an arc circuit, a relaxation oscillator and a pulse generator. The latter is triggered by the oscillator to apply periodic voltage impulses to the arc circuit.

* * *

Welder and Power Plant

2,476,373. Edward A. Hobart, Troy, O. Assigned to The Hobart Brothers Co., Troy, O. Filed May 28, 1946. Granted July 19, 1949.

Newly patented control circuit for a combination welder and power supply unit includes a power-driven generator with two sets of windings, an exciter current, rheostat control in the exciter field and electric switch means connected in parallel to the pair of generator windings. The output circuit includes a variable reactor connected to the switches. The pair of windings is adapted to be connected in parallel or series with each other to provide low and high voltage respectively in the output circuit for welding and power supply operations.

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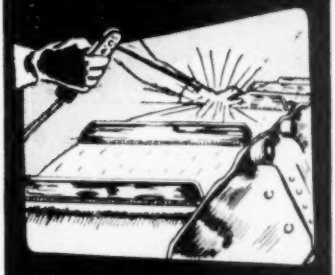
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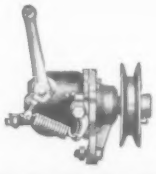

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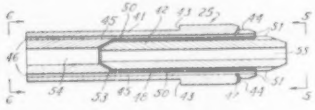
Flame-Cutting Tip

2,491,440. Woodrow S. Boedecker, Prince Bay, N. Y. and Lansing M. Hinrichs, Wilmette, Ill. Assigned to The Bastian-Blessing Co., Chicago. Filed Feb. 5, 1947. Granted Dec. 13, 1949.

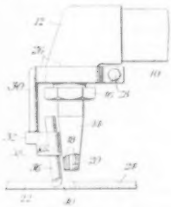


Newly patented flame-cutting tip comprises an elongated body with a central passage through it for a gas containing solid metallic particles. Several passages for oxygen surround and are parallel to the central passage. An inclined annular passage connects the oxygen passages with the central passage.

* * *

Drag Attachment for Torch

2,486,575. Robert M. Rooke, Long Branch, N. J. Assigned to Air Reduction Co., Inc., New York City. Filed March 7, 1945. Granted Nov. 1, 1949.

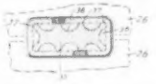


Patent pertains to a drag element for use with a hand guided kerf-cutting torch. The drag element is mounted on the torch so that its lower end is closely adjacent to the cutting tip and projects beyond it. The lower end of the drag element has a tapering portion diverging from a width less than the kerf width to one greater than the kerf. The tapering part projects into the kerf and rides on its edges to produce a drag on the torch and to assist in spacing the torch a predetermined distance from the workpiece.

* * *

Welding Electrode

2,490,023. Arthur A. Bernard, Chicago. Assigned to National Cylinder Gas Co. Filed Feb. 26, 1947. Granted Dec. 6, 1949.



Patent pertains to a continuous electrode for automatic welding processes. The metal core is oblong in cross section with a number of integral ribs. A metal wire is spirally wound on the core in contact with the ribs. The spirally wound wire should be stiffer than annealed wire and in some sections should be stressed beyond the elastic limit. Flux material erases the core and fills the spaces defined by the ribs and winding. The wire is exposed on the surface to conduct current to the metal core.

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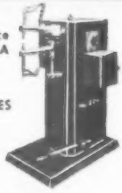

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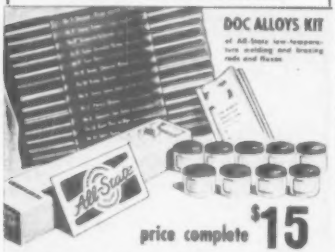

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A
Air Reduction Sales Co. ... 9
Allen Co., L. B. ... 83
Alloy Rods Company ... 13
All-State Welding Alloys Co., Inc. ... 84
American Brass Co., The ... 67
American Chain & Cable Co., Inc. ... 75
American Elin Corp. ... 11
American Industrial Safety Equip. Co. 70
American Optical Co. ... 8
American Platinum Works, The ... 2
Ampco Metal, Inc. ... 60-61
Anti-Borax Compound Company ... 80
Arcos Corp. ... 46
Atlas Welding Accessories Co. ... 47

B
Banner Mfg. Co. ... 72
Bastian-Blessing Co., The ... 55
Becker Bros. Carbon Co. ... 68
Bonney Forge & Tool Works ... 65

C
Chicago Hardware Foundry Co., The ... 81

D
Detroit Stamping Co. ... 66
Dockson Corporation ... 80

E
Eisler Engineering Co., Inc. ... 82

G
General Electric Co. ... 4-5

H
Harnischfeger Corp. ... 41, 69
Harris Calorific Co., The ... 10
Hobart Bros. Co. ... 1, 78

I
Independent Eng. Co., Inc. ... 72
International Nickel Co., Inc. ... 73

J
Jackson Products ... Inside Front Cover
Jewel Mfg. Co. ... 81

K
K-G Welding & Cutting Co., Inc. ... 77

L
Lapeer Manufacturing Co. ... 76
Lincoln Electric Co. ... 14
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp. ... 71

M
Mallory & Co., Inc., P. R. ... 12
Metal Bond Mfg. Co. ... 83
Metal & Thermit Corp. ... 45
Mid-States Welder Mfg. Co. ... 74
Minnesota Mining & Mfg. Co. ... 48
Modern Eng. Co., Inc. ... 76

N
National Carbide Corp. ... 66
National Cylinder Gas Co. ... 6-7

O
Oakite Products, Inc. ... 82

P
Page Steel & Wire Division ... 75
Pierce Governor Co., Inc., The ... 82

R
Ragle Industries, J. M. ... 80
Ransome Machinery Co. ... 62
Reed Engineering Co. ... 64
Reid-Avery Co., Inc., The ... 53
Remont Mfg. Co. ... 82
Revere Copper & Brass Co. ... 16
Ruemelin Mfg. Co. ... 74

S
Safety Gas Lighter Co. ... 78
Sellstrom Mfg. Co. ... 64
Shawinigan Products Corp. ... 80
Square D Company ... 59
Steel Sales Corp. ... 78
Stulz-Sickles Co. ... 81

T
Titanium Alloy Mfg. Co. ... 79
Tube Turns, Inc. ... Back Cover
Tweco Products Co. ... Inside Back Cover

U
Union Carbide & Carbon Corp., The Linde Air Products Co., Unit ... 48
United States Steel Corp. ... 70
United States Steel Supply ... 70

V
Victor Equipment Co. ... 50

W
Welding Alloys Mfg. Co. ... 83
Westinghouse Electric Corp. ... 56-57
Worthington Pump & Machinery Corp. 62

Y
York Engineering Co. ... 68

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT
Selling Opportunities Offered ... 83
Positions Wanted ... 83
Selling Opportunities Wanted ... 83

EQUIPMENT
(Used or Surplus New)
For Sale ... 83

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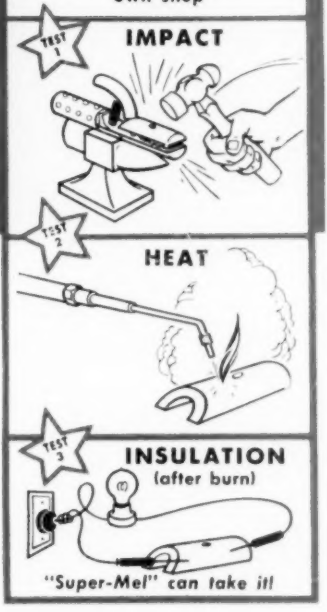

"Super-Mel" is TWECO'S exclusive trademark name for the internally keyed (patented) insulation used only on Twecotong electrode holders. "Super-Mel" tip insulators are precision molded. They are formed from 30 or more layers of glass cloth impregnated with pure melamine resin binder that will not turn to carbon under heat. The same tip insulator fits both top and bottom jaws of all Twecotong models except A-532. A minimum replacement stock is needed and a smaller inventory keeps your holders in tip-top condition under the heaviest usage.

Twecotong is a better electrode holder because it has "Super-Mel" tip insulation. There is a Twecotong model for every type of duty from lightest work to heavy hot-rod service. Each one is "Super-Mel" insulated to withstand heavy impact, intense arc heat and yet retain its insulating qualities. Specify Twecotong for every job in your shop to get long life with maximum insulation and safety.

Twecotong Holders Are Now Available With "Super-Mel" Tip Insulation at No Extra Cost

You'll be pleased with TWECOTONG'S low price and you'll be doubly pleased with the quantity discounts that save you from 10 to 27% more. Write for TWECOLOG No. 7.

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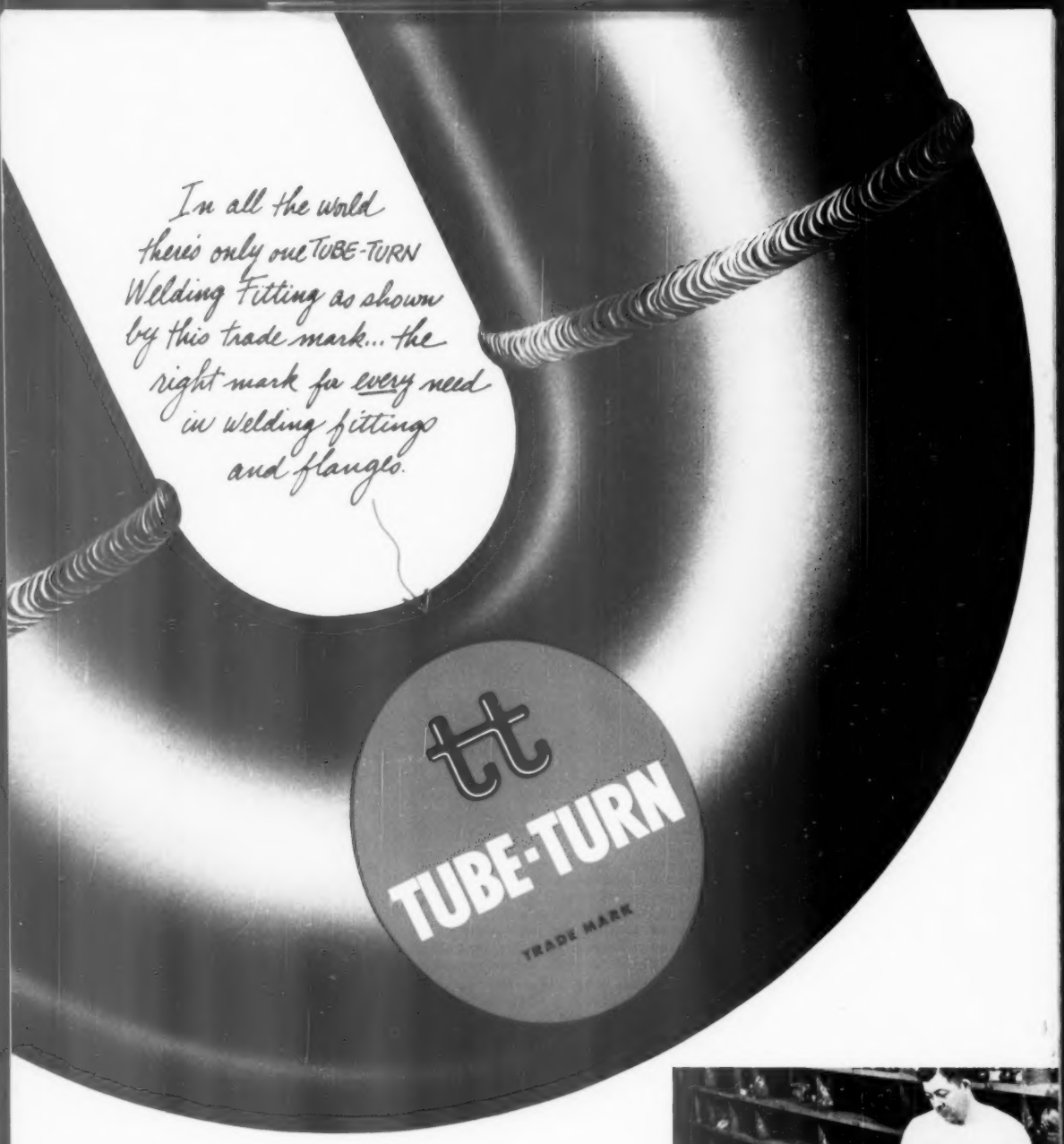

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